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Foreign Voltages and Frequencies Guide

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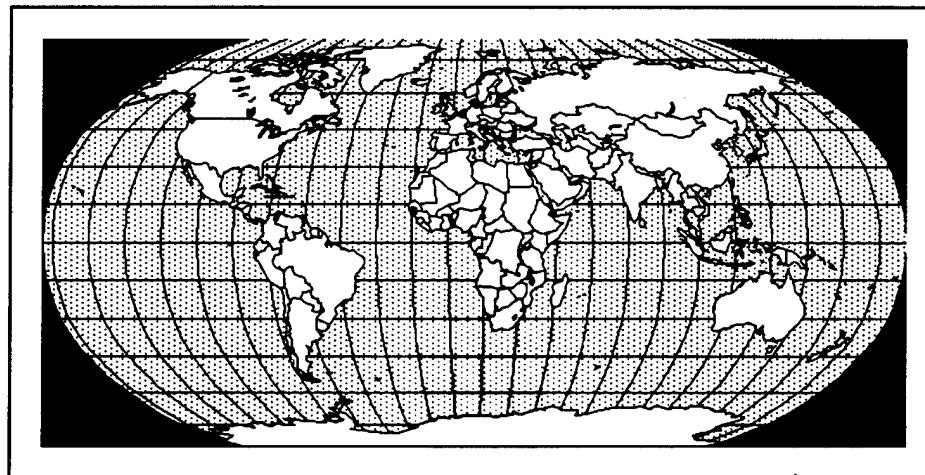
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Foreign countries around the world use different electrical standards for voltage and frequency than those of the United States. Electrical equipment designed for 60 Hertz may or may not operate properly in a 50 Hertz environment. Similarly, electrical equipment designed for 50 Hertz may or may not operate properly in a 60 Hertz environment. Because of these different electrical standards, research was conducted to identify the voltage and frequency standards of various foreign countries, as well as to provide guidance on the operation of various classes of

equipment in different voltage and frequency environments.

This study identifies the various low and medium voltage levels, along with the system frequencies, used by countries around the world. This study also identifies the classes of equipment that are sensitive to voltage and frequency, providing guidance for their operation in different environments. Finally, a listing of U.S. manufacturers of 50 Hertz electrical equipment is provided for reference purposes.

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Foreword

This study was originally published in March of 1993 as USACERL Technical Report FE-93/19, "Survey of U.S. Manufacturers and Vendors of 50 Hz-Sensitive Equipment for Overseas Applications." It was conducted for the U.S. Department of State under Inter-Agency Order (IAO) No. IA10301690; Work Unit IA10301690, "Overseas Power Supply Electrical Equipment." The technical monitor was John Lemanis, Office of Foreign Building Operations, Division of Building and Design and Engineering.

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Distribution

1 Introduction

Background

The Electrical Division of the Center for Public Works (CECPW-EE) provides electrical distribution guidance and field assistance to Army Installations worldwide. USACERL supports these efforts by providing research and development results for technical transfer to the field.

Foreign countries around the world use different electrical standards for voltage and frequency than those of the United States. Some electrical equipment will operate properly at an electrical frequency of either 50 or 60 Hz. Equipment designed for 60 Hz that will not operate properly at 50 Hz is termed "50 Hz sensitive," and equipment designed for 50 Hz that will not operate properly at 60 Hz is termed "60 Hz sensitive." Because of these different electrical standards, guidance is required to identify the voltage and frequency standards of various foreign countries for both medium and low voltage systems, as well as to identify the classes of equipment that are sensitive to voltage and frequency.

Objectives

The objectives of this study were to: (1) identify the various low and medium voltage levels, along with the system frequencies, used by countries around the world, (2) identify the classes of electrical equipment that are sensitive to frequency and voltage, (3) analyze equipment derating methods for different voltage and frequency environments, and (4) list U.S. manufacturers and vendors for each class of equipment identified as 50 Hz sensitive.

Approach

Researchers used a library search to locate a listing of electrical standards of countries around the world. Three documents were located and used to generate Appendix A, which lists frequency and single- and three-phase voltage levels by country: a report by the U.S. Department of Commerce, Bureau of Industrial

Economics, titled *Electric Current Abroad—1984 Edition*; British Standards Institution (BSI) Publication TH20338, *World Electricity Supplies* (1975), and a Utility Data Institute (Division of McGraw-Hill) publication, *International Directory of Electric Utilities* (January 1996).

The types of equipment sensitive to 50 Hz and low and medium voltage levels are discussed in Chapter 2. The several broad categories were divided into classes or types of equipment. The listing of equipment by class was based on *Means Mechanical and Electrical Cost Data* books. A list of vendors for each class and subclass of equipment was developed using the *Information Handling Services* microfilm list and a cross-reference of vendors. The vendors offering the widest range of specifications were preferentially listed for each equipment class in Appendix B.

Derating factors were then developed as discussed in Chapter 3 for 60 Hz equipment that was not produced in 50 Hz configurations. This derating information will be used when special or unique equipment cannot be purchased from the listed U.S. manufacturers in 50 Hz compatible form.

2 Equipment Sensitive to Frequency and Voltage Levels

Theoretical Overview

Equipment sensitive to frequency and/or voltage is designed to operate within certain tolerances. Most equipment is sensitive to large changes in the supply voltage level because more current will flow through a device when the voltage level of the supply is increased (the current through the device is equal to the voltage across the device divided by the impedance of the device). When a larger current flows, the heat dissipated in the device increases (the heat dissipated by the device is proportional to the square of the current). Thus, doubling the voltage will typically double the current, resulting in the device dissipating four times the heat. Most devices cannot tolerate this amount of heat and cannot operate reliably with a supply voltage level more than 10 percent or so higher than their rated voltage.

An additional complication arises in the case of devices that use magnetic coupling. Since most electrical equipment depends on a magnetic field as the medium for transferring and converting energy, the following paragraphs discuss a basic transformer to explain how the magnetic circuit depends on the frequency and amplitude of the applied voltage. This explanation provides the basis for much of the discussion on 50 Hz sensitive equipment that follows, and the discussion on equipment derating in Chapter 3.

A transformer enables electrical energy to be transferred with high efficiency from one voltage level to another at the same frequency. Consider a simplified view of a transformer with a sinusoidal voltage source, v , applied to the primary circuit and the secondary circuit open, as shown in Figure 1. The operation of the transformer depends on several natural laws including the following:

1. A sinusoidal, time-varying flux, ϕ , linking a conducting circuit produces a voltage, e , in the circuit proportional to $d\phi/dt$ (i.e., Faraday's law of induction).
2. The algebraic sum of the voltages around any closed path in a circuit is zero (i.e., Kirchhoff's voltage law).

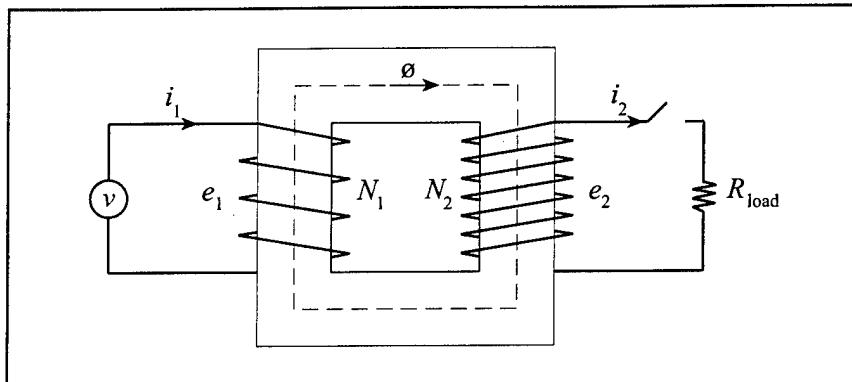


Figure 1. Simplified two-winding transformer.

3. The voltage, v , in a circuit induced by a changing flux is always in the direction in which current would have to flow to oppose the changing flux (i.e., Lenz's law).

When the sinusoidal voltage, v , is impressed onto the primary electrical winding of N_1 turns, it is expected that a sinusoidal current, I , will begin to flow in the circuit, which in turn will produce a sinusoidally varying flux, ϕ . For simplicity, it is assumed that all of the flux set up by the primary circuit lies within the transformer's iron core and it therefore links with all the turns of both windings. If the flux at any instant is represented by the equation:

$$\phi = \phi_m \sin 2\pi ft \quad [\text{Eq 1}]$$

where:

- ϕ_m = the maximum value of the flux
- f = the frequency
- t = time,

it follows from Faraday's law (i.e., $e = N d \phi / dt$) that the instantaneous voltage e_1 induced in the primary winding is:

$$e_1 = 2\pi f N_1 \phi_m \cos 2\pi ft \quad [\text{Eq 2}]$$

The polarity of e_1 will be in accordance with Lenz's law, and hence will be in opposition to the impressed voltage, v (Figure 1). The root mean square (rms) value of e_1 is

$$E_1 = (2\pi/\sqrt{2})fN_1 \phi_m = 4.44fN_1 \phi_m \quad [\text{Eq 3}]$$

Remembering Kirchhoff's voltage law, and assuming that the winding resistance is relatively small, E_1 must be approximately equal to V , where V represents the rms value of the applied voltage. One important result from this equation is that the value of the maximum flux, ϕ_m , is determined by the applied voltage. In other words, for a given transformer, the maximum value of the flux is determined by the amplitude and frequency of the voltage applied to the primary winding.

The same flux that caused E_1 in the primary winding will also induce a voltage across the terminals of the secondary winding. Thus, the only difference in the rms values of the two voltages will come from the difference in the number of turns. If the secondary winding has N_2 turns, the secondary voltage can be written as:

$$E_2 = 4.44fN_2 \phi_m \quad [\text{Eq 4}]$$

Dividing Equation 3 by Equation 4 gives the familiar relationship:

$$E_1/E_2 = N_1/N_2 \quad [\text{Eq 5}]$$

Consider next when the transformer is loaded with a resistor R_{load} by closing the switch in the secondary circuit. If the core flux is in the direction indicated (with the flux increasing), then by Lenz's law, the polarity of E_2 will be such that current I_2 will flow in the secondary winding in attempt to decrease the core flux. The amount of secondary current that will flow will depend on the value of R_{load} (i.e., $I_2 = E_2/R_{\text{load}}$), and the power delivered to the load will equal $E_2 I_2$.

It is important to understand the mechanism by which the power is transferred from the primary circuit to the load. Consider a situation when current is suddenly allowed to flow in the secondary winding by closing the switch. As mentioned previously, the action of this current will be to decrease the core flux. Decreasing the core flux would lower the value of E_1 , which would be in violation of Kirchhoff's voltage law (KVL). Since KVL must be satisfied, more current must flow in the primary winding. The steady-state result is that the primary current will increase

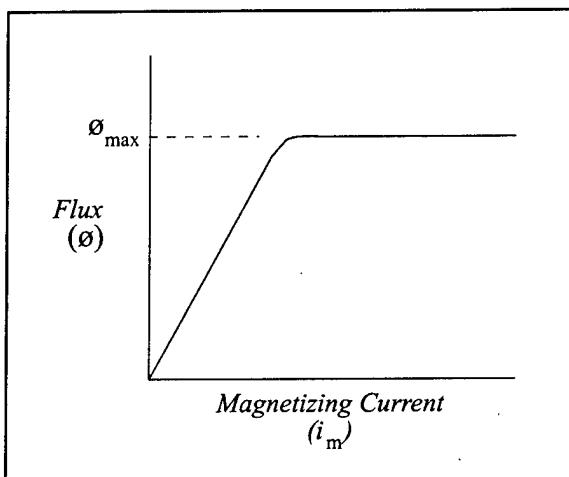


Figure 2. Magnetization curve for the transformer's iron core.

to the value sufficient to neutralize the demagnetizing action of the secondary current. It is important to realize that the resultant flux in the core remains the same regardless of the loading on the transformer. If the level of core flux were to vary with load, then E_1 and E_2 would also vary, which is contrary to what is observed in practice.

An iron core is used in transformers because it provides a good path for magnetic flux and directs the flux so it predominantly links all of the turns in each winding. However, the core has its limitations and can carry only so much flux before it becomes saturated. Core saturation occurs when all of the magnetic domains of the iron align, resulting in a condition in which no further increase in flux density over that of air can be obtained. Consider the magnetizing curve in Figure 2 showing flux versus magnetizing current, where the magnetizing current i_m is the steady-state component of current required to establish the resultant flux level in the iron core for the transformer. It is typical for a transformer, or any other magnetic circuit, to be designed for operation close to the "knee" of this curve (i.e., ϕ_{\max}) to use as much of the iron core as possible. Beyond ϕ_{\max} , the iron saturates and it becomes extremely difficult to further increase the flux level. The curve implies that forcing the iron core into saturation can result in a significant increase in the value of the magnetizing current, and hence, can cause the windings to become overloaded and the transformer to overheat.

This study is concerned primarily with equipment sensitive to 50 Hz and voltage levels since the equipment will be used overseas where voltage frequencies and levels typically are different from those in the United States. This equipment could be listed by item, but a more useful format results when it is divided into classes and subclasses of equipment from which manufacturers for specific pieces of equipment

can be easily selected. Following this format, listed below are the broad classes of equipment sensitive to 50 Hz and building voltage levels. Each section contains specific classes and subclasses of equipment, as listed in Appendix B. Additionally, each section describes why the equipment is sensitive to voltage frequency and/or level. Equipment that does not readily fit into any other category is listed in the section titled "Other Electrical Equipment" (p 18).

HVAC

Heating, ventilation, and air-conditioning (HVAC) equipment includes boilers, furnaces, water chillers, humidifiers, fans, compressors, evaporators, and related equipment. Certain issues must be considered when using HVAC equipment in 50 Hz and alternate voltage environments, including the motor speed and step-down transformers for power supplies, which are discussed below.

The objective of an HVAC system is to provide the necessary heating and cooling to a building in accordance with the design specifications. Typically, alternating current (AC) motors are used in HVAC systems to drive fans, pumps, and compressors. When 60 Hz motor is run off a 50 Hz supply, the shaft speed of the motor is reduced by 5/6 since the motor speed is directly related to the frequency of the applied voltage. This speed will affect all direct-drive applications. For example, a pump that is directly coupled to the motor shaft will transfer less fluid over time if the shaft speed is reduced. Consequently, direct-drive HVAC applications must be derated to account for the reduced motor speed. However, for driven equipment that is tied to the motor through adjustable pulleys, the speed of the driven device can be increased to the necessary level.

Regardless of how the driven equipment is coupled to the motor, the 60 Hz motor must still operate within its rating in the 50 Hz environment. For the motor to deliver the same mechanical power at a lower speed, it must deliver more torque since output power equals torque times the shaft speed. If the motor delivers more torque, more current will flow in the motor and an overloaded condition may result. Hence, a 60 Hz motor may have to be derated to handle the extra current flow.

Another concern with operating a 60 Hz motor with a 50 Hz voltage source is with saturating the iron core of the motor. Like the transformer, the maximum value of flux in the core depends directly on the amplitude of the applied voltage and inversely on the frequency. Assuming that the same voltage level is applied to the 60 Hz motor in the 50 Hz environment, the reduction in frequency to 50 Hz would require an increase in core flux of 20 percent (i.e., 6/5 of its 60 Hz level). If the iron

core of the motor is unable to provide the extra flux, the core will saturate, and a significant increase in the stator currents can result, causing the motor to overheat.

Step-down transformers typically are needed to transform local voltage levels to the levels the equipment is designed for. In most cases, the equipment contains some sort of step-down transformer that typically has to be changed to convert the higher input voltage to the same output voltage. In cases where no step-down transformer is in the equipment, one must be added to avoid burning out components by subjecting them to a higher supply voltage. Determining the need for a step-down transformer and adding it to the equipment is easily accomplished, and is discussed further in Chapter 3.

Equipment designations in Appendix B are divided into mechanical ("M" prefix) and Electrical ("E" prefix). The classes of equipment that fall under the HVAC classification are M10100, M10200, M10300, M10400, M10700, M10900, M11000, M11100, M11200, and M11300. Each class has at least one subclass, and each subclass lists U.S. manufacturers that sell the equipment in that subclass in 50 Hz and several voltage configurations. Equipment that cannot be purchased with the precise specifications needed must be purchased in U.S. specifications and then derated as described in Chapter 3.

Electrical Distribution and Protection

Electrical distribution equipment includes transformers, panelboards and switchboards, generators, transfer switches, capacitors, and related equipment. Electrical protection devices include fuses, circuit breakers, relays, reclosers, and contactors. The devices have different sensitivities to supply voltage and frequency, and are discussed below.

Electrical Distribution

As mentioned earlier, transformers are sensitive to the frequency and amplitude of the supply voltage. Using a 60 Hz transformer in a 50 Hz electrical environment can cause the core of the transformer to saturate, overheating the transformer. Other than the potential problem with saturation, the transformer should be fully capable of supplying the nameplate rated load. Most transformers are available in 50 Hz or 50/60 Hz configurations, so saturation should not be a problem. Appendix B lists transformer types and vendors under the heading E11500.

Panelboards, switchboards, and load centers are generally not sensitive to supply frequency, except when protective devices such as circuit breakers are included in them. These items can be acquired readily in a wide variety of voltage ratings; therefore, supply voltage does not pose a problem. Appendix B lists switchboards under the heading E11200, switchboard instruments are listed under E11300, panelboards are listed under E11000, and load centers are listed under E10800.

General output voltage can be increased or decreased by using an appropriate transformer. However, since generators are typically used to supply backup power when the utility power source fails, and/or are used in addition to the utility power source, it is necessary for the generator to provide a 50 Hz voltage source to match the utility supply. Therefore the user must purchase a generator configured for 50 Hz operation. Appendix B lists several U.S. vendors that produce generators in 50 Hz configurations under E11820.

Automatic source transfer switches are sensitive to supply voltage frequency and amplitude because they are electronically controlled and have power supplies that expect to operate on 60 Hz and rated voltage. Once again, supply voltage level is not a problem since transformers are available to adapt voltage levels. Supply frequency, however, may be a problem depending on the type of power supply the electronics use. Appendix B lists vendors selling 50 Hz source transfer switches under the heading E11800.

Related equipment includes meter centers, and sockets or receptacles. Meter centers are sensitive to voltage level and frequency. Consequently, using a 60 Hz meter center in a 50 Hz environment may result in inaccurate readings. However, meters are readily available in a variety of voltage levels and 50 Hz configurations. Appendix B lists U.S. vendors under the heading E10900.

Sockets or receptacles are needed when foreign consumer products are to be used with the power system. Receptacles are configured for different voltage levels, and these configurations vary in different countries. It is important that the standard receptacle style for a given voltage be used to avoid confusing the user and creating a potential safety hazard. Appendix B lists U.S. vendors for receptacles under E10500.

Capacitors are used in an electrical distribution system to adjust the power factor or phase angle between the voltage and current waveforms. It is desirable to have a phase angle close to zero, or a power factor close to 1 so that most of the power transferred to the load is real power. Real power is the only part of the total kilovolt-amperes transferred that can do work. The balance is called reactive power

and cannot do any useful work. The operation of a capacitor depends on the supply frequency, since a capacitor's impedance, X_c , is related to the capacitance and frequency of the current passing through it by the equation $X_c=1/(j2\pi fC)$, where C is the capacitance in farads and j equals the square root of -1. Appendix B lists capacitor vendors under the heading E11900.

Electrical Protection

Electrical protection devices vary in their sensitivity to supply frequency. All protection devices are available in a wide range of voltage ratings so the level of the supply voltage is not a concern. The main concern with protection devices is the change in response time from 60 Hz to 50 Hz. These devices are coordinated to protect the distribution system from faults (shorts or spikes) but are connected so they do not trip when anticipated voltage spikes (i.e., motor starting) occur. The power system design engineer must be sure to use the proper trip curves for the environment when coordinating protective devices. Trip curves for 50 Hz are readily available from vendors contacted in this study. The only device designed differently for 50 Hz and 60 Hz is the circuit breaker. Appendix B lists several produce circuit breakers with 50 Hz ratings under E11100. Appendix B lists vendors for other electrical protection equipment under the following headings: fuses listed under E10700, relays under E10460, conductors under E10450, and reclosers under E11840.

Medium Voltage Distribution Equipment: 50 Hz→60 Hz

In this section medium voltage transformers, switchgear and associated auxiliary devices will be examined with respect to frequency and voltage changes.

Medium Voltage Distribution Transformers

Distribution transformers are key components in any electric power distribution system. It is important that they are properly matched to their environment. Issues related to operating a 60 Hz transformer from a 50 Hz power source were discussed earlier in this Technical Report. The emphasis here will be on discussing issues concerning operating 50 Hz transformers in a 60 Hz environment.

An important parameter to consider when operating a transformer, or other iron core-based devices, is the ratio of amplitude to frequency of the applied voltage. The ratio obtained using the nameplate rated voltage and frequency should be compared with the ratio available at the proposed site. If the ratio is less than or equal to that

obtained using the nameplate quantities, magnetic saturation will not be a problem at the new site. Any time the ratio is higher than nameplate, the manufacturer should be contacted to ensure that the transformer has enough reserve available to accommodate the increase in operating magnetic flux density.

For example, consider a transformer that is brought over from Germany where it was used on a 10kV, 50 Hz distribution system. It was determined that the electrical insulation system of the transformer was rated for 15kV. It is desired to use the transformer on a 13.8kV, 60 Hz system. Considering the magnetic circuit, the volts-per-hertz ratio of the 50 Hz transformer is 200 (i.e., 10kV/50 Hz). On the new supply the ration would be increased to 230 (i.e., 13.8kV/60 Hz), requiring a higher magnetic flux density in the iron core. This increase could potentially saturate the iron core and overheat the transformer. Alternatively, this transformer could be used on a 7.2kV/60 Hz system (120 volts-per-hertz ratio), where saturation would not be a problem.

A few words should be mentioned concerning iron core loss in transformers. The two primary components of core loss are eddy-current loss and hysteresis loss. Eddy-current loss is the term used to describe the power loss associated with circulating currents that are found to exist in closed paths within the body of a iron material and cause undesirable heat production. Hysteresis loss represents the power loss associated with aligning and realigning the magnetic domains of iron in accordance with the changing magnetic flux. Both components are dependent on the frequency, as shown in the following equations:

$$P_{\text{eddy current}} = K_e f^2 B_m^2 \tau^2 v \quad [\text{Eq } 6]$$

$$P_{\text{hysteresis}} = K_h f B_m^2 v \quad [\text{Eq } 7]$$

where,

- K = constant value dependent upon material
- f = frequency of variation of flux
- B = maximum flux density
- v = total volume of the material
- τ = lamination thickness.

It should be noted that, even though frequency increases when using 50 Hz transformers on a 60 Hz-based system, the voltage-to-frequency ratio will typically be lower, and hence, the maximum flux densities B will be lower. The result is that core-losses will generally not increase as a result of the higher frequency used.

Other key parameters are voltage and current. To maintain insulation system integrity, rated voltage and/or current for the transformer should not be exceeded. A transformer can be operated on lower than rated voltage; however, its current rating must not be violated. Also, the secondary voltage must be matched to the proper voltage levels.

In addition to having an iron core, windings, and insulation system, distribution transformers may include tap changers and auxiliary devices. Auxiliary devices might include fans, current transformers, pressure relief devices, and lighting arresters. Once again, attention should be focused on devices that use a magnetic field for transferring or converting energy, such as instrument transformers and small motor drives. Even if the voltage-to-frequency ratio is found to be lower, manufacturers should be contacted to make sure that all linear and rotating drive mechanisms will develop adequate force and torque to function properly.

Medium Voltage Switchgear

Switchgear is a general term covering switching and interrupting devices alone, or their combination with other associated control, metering, protective, and regulating equipment. Common switchgear components include the power bus, power circuit breaker, instrument transformers, control power transformer, meters, control switches, protective relays and ventilation equipment. The ratings of switchgear assemblies are designations of the operational limits under specific conditions of ambient temperature, altitude, frequency, duty cycle, etc. For example, the performance of some 50 Hz magnetic type circuit breakers may be altered slightly when operated on a 60 Hz power system. Switchgear manufacturers should always be consulted to identify the frequency response of circuit breakers and all auxiliary devices.

Safety and Security Equipment

Safety and security equipment includes fire detection systems, burglar alarm systems, doorbells, and surveillance systems. This equipment typically operates on low voltage, either alternating current (AC) or direct current (DC), generated initially by a power supply. Acquiring the proper power supply to convert from the supply voltage to the low voltage that these systems expect (typically 6 to 12 VAC or VDC) is the key to proper operation of these systems in foreign environments. Power supplies of 50 Hz/120VAC usually are available from vendors of these systems, and a transformer can be used to step a 240VAC supply down to a 120 VAC foreign environment. Therefore, derating is not necessary for these items, although

a transformer may be needed to step high voltage supply levels down to 120VAC for the power supplied to these systems.

Most vendors of safety and security equipment can configure their equipment to 50 Hz and a variety of voltage levels. Appendix B lists these vendors under the following headings: fire detection equipment under E12900, burglar alarm systems under E12400, doorbells under E12410, and surveillance systems under E12420.

Communication Equipment

Communication equipment encompasses public address systems and sound systems, both of which operate on a low-voltage DC supply generated by a power supply. Power supplies are available to operate on 50 Hz and 240V supply voltages. In cases where only 120/50 Hz supplies are available, a step-down transformer can be used to step a 240V supply down to 120V. The vendors contacted in this study have stated that they provide 50 Hz power supplies. Appendix B lists these vendors under E12700.

Lighting

Lighting can be divided into incandescent, fluorescent, and high intensity discharge (HID) categories. Incandescent lighting is not frequency-sensitive, whereas fluorescent and HID lights are started by a ballast that is sensitive to voltage level and frequency. All types of lighting are sensitive to the supply voltage level and cannot be derated for voltage. For example, subjecting a 120V incandescent lamp to a 240V source will result in the lamp burning twice as hot, causing rapid lamp failure. Subjecting the iron core ballast used in many HID and fluorescent fixtures to twice its rated voltage will saturate the ballast and will subject the fixture to much more than its rated current. As with transformers and motors, 60 Hz iron-core ballasts can also be saturated when operated at 50 Hz.

At first thought, frequency dependence may not be as much of a problem with electronic ballasts since, in most cases, the AC voltage source is first converted back to a high frequency AC source, and therefore, the voltage source that is actually impressed across the lamp is decoupled from the 60 Hz AC source. However, the power supply used to power the electronics in these ballasts must be capable of 50 Hz operation. Appendix B lists several vendors of 50 Hz and different voltage lighting equipment under E12000 and E12100.

Other Electrical Equipment

Other electrical equipment includes motors, motor starters, computer power supplies, and clocks. An induction motor's dependence on frequency and voltage level was described in the section about HVAC equipment. Appendix B lists several vendors that produce motors rated at various voltage levels and 50 Hz under E11400.

Typically, motor starters are sensitive to both supply voltage level and frequency. The most commonly used motor starters consists of a coil, thermal overloads, and a set of contactors (contacts). The thermal overloads, which are essentially circuit breakers, and the contactors are rated to handle a certain amount of current. Since at 50 Hz, a motor of a given horsepower rating will draw more current than an identically-rated motor would draw at 60 Hz, the thermal overloads and the contactors must be sized accordingly. Appendix B lists vendors for motor starters under E 10600.

Computer power supplies include voltage regulators, isolation transformers, transient voltage suppressor transformers, computer regulator transformers, and power conditioning transformers. Computer power supplies are sensitive to both frequency and voltage level. Appendix B lists vendors from whom power supplies can be purchased in the appropriate 50 Hz configuration under E11700.

Clocks are sensitive to supply frequency and voltage. Clocks rely on the frequency of the supply voltage to keep correct time, so a clock designed for 60 Hz will not keep correct time at 50 Hz. Also, the motor that runs the clock is sensitive to supply voltage level for the reasons described above for motors. Therefore, a clock must either be purchased configured for the supply voltage level, or a transformer must be used to convert the supply voltage level to the clock's rated voltage level. Clocks cannot be derated for frequency, and therefore clocks designed for 50 Hz must be purchased. Appendix B lists vendors that produce clocks in 50 Hz configurations under E12300.

3 Equipment Derating

Derating Under 50 Hz Conditions

Derating factors for 50 Hz operation are developed differently for different types of equipment. Derating factors for HVAC, electrical distribution and protection, safety and security equipment, communication equipment, lighting, and other electrical equipment will be discussed and derived where appropriate.

HVAC

The frequency of the supply voltage affects two types of components in HVAC systems: motors and controls. From the discussion in Chapter 2, for the same mechanical load and voltage level, a 60 Hz motor will draw 20 percent more current when supplied from a 50 Hz voltage source (assuming the iron core of the motor does not saturate). Therefore, a 60 Hz motor would have to be capable of handling the increase in current level. However, as was also mentioned in the previous chapter, saturation can be a serious problem when running a 60 Hz motor off a supply frequency of 50 Hz. Developing a derating factor to account for saturation is not possible, since the motor designs vary from vendor to vendor, and hence, the degree of saturation that would occur, if any, would be impossible to predict. Consequently, it is recommended that no horsepower derating be performed, and a 50 Hz motor be purchased.

However, if the vendor can guarantee the user that a given 60 Hz motor would not saturate at 50 Hz, then the motor would need only to be derated to handle the 20 percent increase in current level. The amount of horsepower derating required would depend on the motor's mechanical load, service factor, and thermal limit. The service factor is a measure of how much the motor can be overloaded continuously without exceeding safe temperature limits. The thermal limit is the minimum speed at which an AC motor can be operated with rated amperes, without exceeding safe temperature rise. The thermal limit is important because the motor's ability to cool itself will be reduced at lower speeds unless, of course, some sort of auxiliary cooling is used. In most cases, however, the minimum shaft speed necessary to exceed the thermal limit is much lower than 1500 revolutions per minute (RPM, e.g., for a 4-

pole motor), so 50 Hz operation should not be a problem, although the vendor should be contacted for verification. A 60 Hz motor with a 1.20 service factor can be operated safely while overloaded continuously by 20 percent. The same motor can be operated safely with a rated mechanical load and a 50 Hz power supply with no horsepower derating, assuming saturation is not an issue, the thermal limit of the motor is not exceeded, and the same voltage amplitude is applied. However, a 60 Hz motor, with a 1.0 service factor, driving a rated mechanical load would have to be derated for horsepower by 20 percent, since it is not capable of handling greater than the rated current. In summary, the user should find out the service factor and thermal limit of the motor to determine the amount of horsepower derating required, and to ensure that the 20 percent increase in current level in the motor does not exceed the motor's rating (again, assuming saturation is not a concern).

Another issue to be considered when purchasing HVAC equipment for a 50 Hz environment is that the motor's shaft will spin 5/6 as fast as it would with a 60 Hz supply. For a 4-pole motor, the shaft will rotate at roughly 1500 RPM when run off a 50 Hz supply, whereas with a 60 Hz voltage source it will rotate at about 1800 RPM. Consequently, equipment that is directly coupled to the shaft of the motor will rotate at 5/6 the speed it would in a 60 Hz environment. Hence, direct-drive equipment must be derated to account for the change in speed. In cases where the equipment is indirectly coupled to the motor shaft, through the use of adjustable pulleys for example, the reduction in shaft speed is not as much of a problem since the required speed of rotation can be obtained through the proper adjustment or selection of the pulleys.

Additionally, electronic HVAC controls that contain their own power supply may be 50 Hz sensitive. Most of the vendors contacted stated that this typically is not a problem because most controls are frequency-sensitive. If the control are 50 Hz sensitive, they must be purchased in a 50 Hz configuration. The HVAC vendor must be consulted on a case-by-case basis to determine if the controls can be used in 50 Hz environments.

Electrical Distribution and Protection

In general, a 60 Hz transformer should not be used with a 50 Hz voltage source because of the potential saturation problem. As with motors, a derating factor cannot be developed to account for saturation because of the many different transformer designs on the market. It is recommended that a 50 Hz transformer be purchased for use with a 50 Hz voltage source. However, if a 60 Hz transformer vendor can ensure that a transformer will not saturate when operated at 50 Hz, the

transformer should be fully capable of safely supplying its nameplate rate load (i.e., no horsepower derating is required). In terms of the transformer's equivalent impedance, sometimes used for power system studies (e.g., short-circuit and load-flow analysis), the 60 Hz value should be derated by 5/6 to account for the reduction in system frequency.

Power factor capacitors rate at 60 Hz must also be derated to 50 Hz. Capacitors do not consume any real power, but they do consume reactive power. The rating given to power factor capacitors is given in units of Kilovolt-amperes reactive (KVAR), which indicates the amount of reactive power the capacitor will consume at the rated frequency. As mentioned in Chapter 2, the capacitor's impedance, X_c , is inversely related to frequency. If the frequency drops from 60 to 50 Hz, the impedance will increase to 6/5 of its 50 Hz value. Since the KVAR rating equals V^2/X_c , if X_c at 50 Hz increases to 6/5 of its 60 Hz rating, the KVAR rating will decrease to 5/6 of its 60 Hz rating when the capacitor is used in a 50 Hz environment. Therefore, a 60 Hz-rated capacitor must have the KVAR rating multiplied by 5/6 to yield its 50 Hz KVAR rating.

Other electrical protection and distribution equipment either cannot or should not be derated. Electrical protection devices are generally able to be used at either 50 Hz or 60 Hz, but a different trip curve needs to be used by the power system designer for 50 Hz. These 50 Hz trip curves are readily available from vendors of this equipment, so no derating is necessary. The only exception is that some circuit breakers are designed differently at 50 Hz and 60 Hz. Appendix B lists several vendors that produce circuit breakers at 50 Hz and 60 Hz.

Voltage, current, and power meters can be derated, but this practice is not recommended. A meter should display the true value it is supposed to measure to ensure that the readings are interpreted correctly and that no dangerous situations result. Meters, therefore, should not be derated. Automatic transfer switches use power supplies that may or may not be frequency-sensitive. Vendors must be contacted regarding 50 Hz configuration of these devices. Electrical generators must be purchased already configured to provide a 50 Hz voltage source. Appendix B lists several vendors that produce the equipment in 50 Hz configurations for each type of electrical distribution equipment.

Safety and Security Equipment

Safety and security equipment operate on a low-voltage AC or DC source that is generated by a power supply. Some power supplies are sensitive to frequency;

others are not. In either case, derating is not necessary since power supplies sensitive to frequency cannot be derated, and power supplies insensitive to frequency do not need to be derated. In cases where the power supplies are sensitive to 50 Hz, vendors are able to ship the equipment with a 50 Hz-compatible power supply. Appendix B lists vendors for safety and security equipment.

Communication Equipment

Communication equipment operates on a low-voltage DC supply and does not need to be derated for frequency. Vendors will either ship the units with frequency-insensitive power supplies, or they will configure the units for 50 Hz operation before shipping. Appendix B lists vendors for communications equipment.

Lighting

Incandescent lighting is not frequency-sensitive since this type of lighting consists of a resistive element (the filament), which is not frequency-sensitive. Fluorescent and HID lighting, on the other hand, use a ballast to generate the proper lamp voltage and to limit the current flowing through the lamp. These ballasts are sensitive to frequency. Because of the numerous ballast designs and styles on the market, and the potential saturation problem, a simple derating factor cannot be developed and it is recommended that a vendor supplying 50 Hz-rated ballasts be located from the listing of vendors in Appendix B.

Other Electrical Equipment

Other electrical equipment consists of motors, motor starters, computer power supplies, and clocks. Motor derating was mentioned earlier in the HVAC section of this chapter. Motor starters are sensitive to frequency as well, but indirectly so. Since a 60 Hz motor will draw 20 percent more current when operated off a 50 Hz voltage source, assuming the same voltage amplitude is applied and there is no saturation problem, the motor starter current rating must be derated by 20 percent to account for the increase in current.

Clocks and computer supply equipment are sensitive to frequency and cannot be derated. Clocks rely on the frequency of the supply to keep correct time, so a 60 Hz clock will not keep correct time at 50 Hz. Although derating factors could be developed for clocks, they would be meaningless. Computer power supply

equipment cannot be derated due to the way the equipment is constructed. Appendix B lists vendors who supply clocks and computer supply equipment configured for 50 Hz operation.

Derating Under Alternate Voltage Conditions

As Appendix A shows, standard one-phase voltages around the world are either in the range of 100-127VAC or 220-240 VAC. Voltage variations within about 10 percent of an equipment's rated voltage are acceptable, so derating for voltage will only be necessary when a piece of equipment rated for U.S. voltage (approximately 115VAC) needs to be operated in an environment using 220-240VAC. This would be a doubling of rated voltage. None of the equipment sensitive to voltage level is capable of surviving this increase without rapid failure. Thus, no derating factors for voltage level are offered. Instead, it is recommended that transformers be used to step the higher voltage level down to a voltage level in the range of 100-127VAC, which U.S. equipment can tolerate. Appendix B lists vendors from whom these transformers are readily under the heading E11500 - Transformers. It has been found, however, that most vendors of voltage-sensitive equipment are able to configure the equipment for 220-240VAC and corresponding three-phase voltage levels. Appendix B lists these vendors are listed under the appropriate headings. Appendix D lists the vendors alphabetically. Appendix E contains summary tables organized by equipment numbers, that contain available voltage levels, derating capability and method, and vendors for each type of equipment.

4 Summary and Recommendations

Appendix A of this report lists electric standards by country. This listing can be used to rapidly identify the standard frequency and voltage levels in other countries. In cases where cities within a country differ in their electrical standards, the cities are listed separately. For countries in which all cities have the same electrical standards, typically only the capital city is listed. In these cases, assume that all cities in the country have the same electrical standards.

This research identified six types of equipment sensitive to 50 Hz: heating, ventilation, and air-conditioning; electrical distribution and protection; safety and security; communication; lighting; and other electrical equipment (e.g., motors, starters, clocks). Appendix B lists this equipment, by class and subclass, and includes the names of U.S. manufacturers/vendors who produce the equipment configured to operate using foreign electrical standards.

Derating factors were discussed and developed for the six generic types of equipment. Appendix C, which summarizes the discussion of derating factors presented in Chapter 3, is useful in identifying derating factors quickly and easily.

This research also yielded a comprehensive list of the U.S. manufacturers and vendors of 50 Hz-sensitive equipment. Appendix D contains this list. Appendix E contains summary tables that complete the information gathered during this research.

Although Chapter 3 presented derating factors for equipment, it is recommended that, whenever a piece of equipment is to be derated, the vendor be contacted to discuss the derating. It is always preferable to locate a vendor that will supply the equipment with the desired ratings before derating is attempted. The majority of vendors contacted are able to supply equipment rated at 50 Hz and a variety of voltage levels, so derating should be necessary in only a few cases.

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Appendix A: Frequency and Single- and Three-Phase Voltage Levels by Country

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Afghanistan	50	1,3	220/380	3.2, 6, 10, 15, 20
Algeria	50	1,3	127/220 220/380	5.5, 6.6, 10, 30
American Samoa	60	1,3	120/240 240/480	NA
Angola	50	1,3	220/380	NA
Antigua	60	1,3	230/400	NA
Argentina	50	1,3	220/380	6.6, 13.2, 33
Australia	50	1,3	240/415	6.6, 7.6, 11, 12.7, 19, 22, 33, 66
Austria	50	1,3	220/380	3, 5, 6, 10, 20, 25, 28, 30
Azores				NA
Ponta Delgada	50	1,3	110/190 220/380	
All Others	50	1,3	220/380	
Bahamas	60	1,3	120/240 120/208	7.2, 11
Bahrain				11
Awali	60	1,3	230/400	
All Others	50	1,3	230/400	
Bangladesh	50	1,3	220/380	11, 33 (varies seasonally)
Barbados	50	1,3	115/230 115/200	11, 24

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Belgium				6.6, 10, 15, 36, 70*
Anderlecht	50	1,3	220	
Antwerpen	50	1,3	127/220 220/380	
Brugge	50	1,3	220/380	
Brussels	50	1,3	127/220 220/380	
Charlerio	50	1,3	230/400	
Gentbrugge	50	1,3	220/380	
Hasselt	50	1,3	130/220 220/380	
Hoboken	50	1,3	127/220 220/380	
Huy	50	1,3	220	
Jette	50	1,3	127/220	
Leige	50	1,3	220/380	
Liege- Monsinport	50	1,3	110/220 220/380	
Lokeren	50	1,3	220/380	
Leuven	50	1,3	220/380	
Mechelen	50	1,3	220/380	
Mons	50	1,3	220/380	
Namur	50	1,3	220/380	
Oostende	50	1,3	127/220 220/380	
Ronse	50	1,3	220/380	
Seraing	50	1,3	220/280	
Turnhout	50	1,3	220	
Uccle	50	1,3	220/380	
Vilvoorde	50	1,3	120/220 220/380	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Belize				6.6, 22*
Belize City	60	1,3	110/220 220/440	
Balmopan	60	1,3	110/220 220/240	
Corozal Town	60	1,3	110/220 220/440	
Orange Walk	60	1	110/220	
San Ignacio	60	1	110/220	
Stann Creek	60	1	110/220	
Punta Gorda	60	1,3	110/220 220/440	
San Pedro	60	1	110/220	
Benin	50	1,3	220/380	15, 20
Bermuda (Island-wide)	60	1,3	120/240 120/208	NA
Bolivia				6.6, 24.9*
Calamarca	50	1,3	230/400	
Challapata	50	1,3	220/380	
Cobija	50	1,3	230/400	
Cochabamba	50	1,3	220/380	
Guayaramerin	50	1,3	230/400	
La Paz	50	1,3	???/230	
Potosi	50	1,3	220/380	
Oruro	50	1,3	110/220	
Riberalta	50	1,3	230/400	
Santa Cruz	50	1,3	220/380	
Sucre	50	1,3	220/380	
Trinidad	50	1,3	230/400	
Tupiza	50	1,3	220/380	
Viacha	50	1,3	110/220	
Villazon	50	1,3	220/380	
Bosnia/ Herzegovina	NA	NA	NA	6.6, 10
Botswana	50	1,3	220/380	11, 33, 66

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Brazil				6, 11.4, 13.8, 22, 25, 34.5*
Barbacena	60	1,3	110/220	
Blumenau	60	1,3	220	
Braganca	60	1,3	110/220	
Brasilia	60	1,3	220/380	
Caxias do Sul	60	1,3	220/380	
Cel Fabriciano	60	1,3	110/220	
Corumba	60	1,3	110/220	
Florianopolis	60	1,3	220/380	
Fortaleza	60	1,3	230/400	
Goiania	60	1,3	220/380	
Goias	60	1,3	220/380	
Itajai	60	1,3	220	
Joao Pessoa	60	1,3	220	
Joinville	60	1,3	220/380	
Jundiai	60	1,3	110	
Livramento	60	1,3	220/380	
Londrina	60	1,3	127/220	
			110/220	
Macapa	60	1,3	110/220	
Maceio	60	1,3	220/380	
Manaus	60	1,3	120/240	
Mossoro	60	1,3	220/380	
Natal	60	1,3	220/380	
Nova Friburgo	60	1,3	220	
Olinda	60	1,3	127/220	
			220/380	
Paranagua	60	1,3	110/220	
Parnaiba	60	1,3	110/220	
Pelotas	60	1,3	220/380	
Petropolis	60	1,3	127/220	
			115/220	
Ponto Grossa	60	1,3	220	
Porto Velho	60	1,3	110/220	
Santo Andre	60	1,3	115/230	
Sao Bernardo do Campo	60	1,3	115/230	
Sao Caetano do Sul	60	1,3	110/220	
Sao Luis	60	1,3	110/220	
Sao Paulo	60	1,3	115/230	
Teresina	60	1,3	110/220	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Brunai	NA	NA	NA	11, 68
Bulgaria	50	1,3	220/380	NA
Burma/Myanmar	50	1,3	230/400	3.3, 6.6, 11, 33
Burundi	50	1,3	220/380	6.6, 15
Cambodia				4.4, 6.3, 15*
Phnom-Penh	50	1,3	220/380	
Sihanoukville	50	1,3	220/380	
All Others	50	1,3	120/208	
Cameroon				10, 15, 30, 33, 55*
Buea	50	1,3	230/400	
Eseka	50	1,3	127/220	
Maroua	50	1,3	127/220	
Mbalmayo	50	1,3	127/220 220/380	
Nkongsamba	50	1,3	127/220 220/380	
Sangmelima	50	1,3	127/220 220/380	
Victoria	50	1,3	230/400	
Yaounde	50	1,3	127/220 220/380	
All Others	50	1,3	220/380	
Canada	60	1,3	120/240	2.4, 4.16, 7.2, 8, 12.47, 13.8, 14.4, 20, 25, 34.5, 44, 49
Canary Islands	50	1,3	127/220 220/380	NA
Cape Verde (Praia)	50	1,3	220/380	6, 6.3, 13, 15, 20
Cayman Islands	60	1,3	120/240	NA
Central African Republic				NA
	50	1,3	220/380	
Chad	50	1,3	220/380	15
Channel Islands				11
Alderney	50	1,3	240/415	
Guernsey	50	1,3	230/400	
Jersey	50	1,3	240/415	
Chile	50	1,3	220/380	12, 13.2, 13.8, 15, 23

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
China	50	1,3	220/380	10, 20, 35
Colombia				4.16, 7.6, 13.2, 13.8, 33, 34.5, 44*
Bogata	60	1,3	150/240	
Duitama	60	1,3	120/208	
Honda	60	1,3	120/208	
Sogomosa	60	1,3	120/240	
All Others	60	1,3	110/220	
Congo	50	1,3	220/380	5.5, 6.6, 10, 20
Costa Rica	50	1,3	120/240	4.2, 13.2, 24.9, 34.5
Croatia	50	1,3	220/380	10, 35
Cyprus	50	1,3	240/415	11
Czech Republic	50	1,3	220/380	6, 10 (urban) 22, 35 (rural)
Denmark	50	1,3	220/380	6, 10, 20, 30
Djibouti	50	1,3	220/380	NA
Dominican Republic	60	1,3	110/220	2.5, 4.16, 12.5

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Ecuador				13.8, 34.5, 46, 69*
Cuenca	60	1,3	120/208	
Esmeraldas	60	1,3	120/208 120/240	
Guaranda	60	1,3	120/208 120/240	
Ibarra	60	1,3	127/220	
Latacunga	60	1,3	120/208	
Loja	60	1,3	127/220	
Machala	60	1,3	127/220	
Morona	60	1,3	120/208	
Portoviejo	60	1,3	127/220	
Puyo	60	1,3	127/220	
Quito	60	1,3	120/208 127/220	
Riobamba	60	1,3	110/220	
Tulcan	60	1,3	121/210 127/220	
Zamora	60	1,3	121/210 127/220	
All Others			120/208 127/220	
Egypt	50	1,3	220/380	3, 6.6, 11, 20, 33, 66
El Salvador	60	1,3	115/230	4.16, 4.4, 13.2, 23, 34.5
England (see United Kingdom)				
Equatorial Guinea	50	1	220	NA
Ethiopia	50	1,3	220/380	15
Faroe Islands	50	1,3	220/380	NA
Fiji	50	1,3	240/415	11
Finland	50	1,3	220/380	10, 20, 30, 45

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
France				3.3, 5.5, 10, 15, 20, 30*
l'Alpe d'Huez	50	1,3	127/220 220/380	
Alencon	50	1,3	127/220 220/380	
Amiens	50	1,3	115/220 220/380	
Angers	50	1,3	127/220 220/380	
Angouleme	50	1,3	127/220 220/380	
Annecy	50	1,3	127/220 220/380	
Arcachon	50	1,3	127/220 220/380	
Argenteuil	50	1,3	127/220 220/380	
Asnieres	50	1,3	115/200 220/380	
LaBaule	50	1,3	127/220 220/380	
Besancon	50	1,3	127/220 220/380	
Beziers	50	1,3	127/220 220/380	
Biarritz	50	1,3	127/220 220/380	
Boulogne-sur-Mer	50	1,3	127/220 220/380	
la Bourboule	50	1,3	127/220 220/380	
Bourges	50	1,3	127/220 220/380	
Bourg-En-Bresse	50	1,3	127/220 220/380	
Brest	50	1,3	127/220 220/380	
Briancon	50	1,3	115/200	
Cabourg	50	1,3	127/220 220/380	
Caen	50	1,3	127/220	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
France (cont'd)				
Calais	50	1,3	115/220 220/380	
Cauterets	50	1,3	127/220	
Chalons	50	1,3	127/220 220/380	
Chateauroux	50	1,3	120/208 220/380	
Chaumont	50	1,3	120/208 220/380	
Cherbourg	50	1,3	127/220 220/308	
Chinon	50	1,3	127/220 220/308	
Clermont-Ferrand	50	1,3	127/220 220/308	
Collioure	50	1,3	127/220 220/380	
Courbevoie	50	1,3	115/230	
Deauville	50	1,3	127/220 220/380	
Dieppe	50	1,3	127/220 220/380	
Dijon	50	1,3	127/220 220/380	
Dinan	50	1,3	127/220 220/380	
Douai	50	1,3	127/220 220/380	
Dreux	50	1,3	127/220 220/380	
Etain	50	1,3	115/200 220/380	
Evreux	50	1,3	127/220	
Fontainbleau	50	1,3	127/220 220/380	
Frejus	50	1,3	127/220 220/380	
Grenoble	50	1,3	127/220	
LeHavre	50	1,3	110/190 127/220 220/380	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
France (cont'd)				
Joungue	50	1,3	127/220 220/380	
Juan-les-Pins	50	1,3	127/220	
Lens	50	1,3	127/220 220/380	
Lille	50	1,3	110/220 220/380	
Luchon	50	1,3	127/220 220/380	
Luxeuil-Bains	50	1,3	127/220 220/380	
Lyon	50	1,3	110/220 127/220 220/380	
LeMans	50	1,3	127/220 220/380	
Marly-le-Roi	50	1,3	127/220 220/380	
Marseille	50	1,3	115/200 220/380	
Megev	50	1,3	127/220	
Metz	50	1,3	110/190 220/380	
Lemont-Dore	50	1,3	127/220 220/380	
Motlucon	50	1,3	127/220 220/380	
Morzine	50	1,3	127/220 220/380	
Mulhouse	50	1,3	230 220/380	
Nancy	50	1,3	127/220 220/380	
Nantes	50	1,3	110/190	
Neuilly	50	1,3	115/230 127/220 220/380	
Nice	50	1,3	127/220	
Nimes	50	1,3	220 220/380	
Orleans	50	1,3	127/220	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
France (cont'd)				
Perpignan	50	1,3	127/220 220/380	
Roanne	50	1,3	127/220 220/380	
LaRochelle	50	1,3	115/200 127/220 220/380	
Roubaix	50	1,3	220/380	
Royan	50	1,3	127/220 220/380	
Saint-Etienne	50	1,3	115/230 127/220 220/380	
Saint-Gervais-Les-Bains	50	1,3	127/220 220/380	
Saint-Jean-de-Lux	50	1,3	380	
Saint Lo	50	1,3	127/220 220/380	
Saint Quentin	50	1,3	127/220 220/380	
Sallanches	50	1,3	127/220	
Strasbourg	50	1,3	125/220 220/380	
Tabes	50	1,3	115/200 220/380	
Toulon	50	1,3	127/220 220/380	
Tourcoing	50	1,3	110/220 220/380	
Tours	50	1,3	127/220	
Val d' Isere	50	1,3	127/220 220/380	
Valenciennes	50	1,3	127/220 220/380	
Valloire	50	1,3	127/220	
Verdun	50	1,3	127/220 220/380	
Versailles	50	1,3	127/220 220/380	
Vichy	50	1,3	127/220	

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Vincennes	50	1,3	127/220 220/380	
All Others	50	1,3	220/380	
French Guiana	50	1,3	220/380	NA
Gabon	50	1,3	220/380	5.5, 20
Gambia	50	1,3	220/380	11, 33
Germany	50	1,3	220/380	3, 6, 10, 20, 30, 45, 60
Ghana	50	1,3	220/400	11, 33, 34.5
Gibraltar	50	1,3	240/415	NA
Greece	50	1,3	220/380	6.6, 15, 20, 22
Greenland	50	1,3	220/380	NA
Grenada	50	1,3	230/400	NA
Guadeloupe	50	1,3	220/380	20
Guam	60	1,3	110/220 120/208	4, 13.8
Guatemala	60	1,3	120/240	22, 34.5, 50
Guinea	50	1,3	220/380	5.5, 6.3, 15, 20, 30
Guinea-Bissau	50	1,3	220/380	6, 10, 20, 30
Guyana	50	1,3	110/220	2.3, 4, 11, 13.8
Haiti				2.4, 4.2, 7.2, 12.5*
Cap Haitien	60	1,3	120/208	
Gonaives	60	1,3	120/208	
All Others	50	1,3	110/220	
Honduras	60	1,3	110/220	2.4, 4.2, 13.8, 34.5, 69
Hong Kong	50	1,3	200/346	11, 33
Hungary	50	1,3	220/380	6, 10, 20, 22, 30, 35
Iceland	50	1,3	220/380	6, 11, 22, 33

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
India				2.2, 3.3, 6.6, 11, 15 11*
Bombay City	50	1,3	230/400 230/460	
Madras	50	1,3	230/400 250/440	
Mussoorie	50	1,3	220/380	
Naini Tal	50	1,3	220/380	11
New Delhi	50	1,3	230/400 230/415	
Patna	50	1,3	220/380	
Simla	50	1,3	220/380	
All Others	50	1,3	230/400	
Indonesia				3-20*
Jakarta	50	1,3	220/380	
All Others	50	1,3	127/200	
Iran	50	1,3	220/380	11, 20, 33, 63, 66
Iraq	50	1,3	220/380	6.6, 11
Ireland	50	1,3	220/380	5, 10, 20, 38
Isle of Man	50	1,3	240/415	NA
Israel	50	1,3	230/400	6.3, 12.6, 22, 33*
Jerusalem	50	1,3	220/380	
Italy	50	1,3	127/220 220/380	3.6, 10, 15, 20, 30, 45, 66
Ivory Coast	50	1,3	220/380	NA
Jamaica	50	1,3	110/220	6.9, 13.8, 24

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Japan				3, 6, 6.6, 11, 20, 22, 60*
Chiba	50	1,3	100/200	
Hakodate	50	1,3	100/200	
Kawasaki	50	1,3	100/200	
Muroran	50	1,3	100/200	
Niigata	50	1,3	100/200	
Otaru	50	1,3	100/200	
Sapporo	50	1,3	100/200	
Sendai	50	1,3	100/200	
Tokyo	50	1,3	100/200	
Yokohama	50	1,3	100/200	
Yokosuka	50	1,3	100/200	
All Others	60	1,3	100/200	
Jordan	50	1,3	220/380	6.6, 11, 33
Kenya	50	1,3	240/415	11, 33, 40, 66
Korea	60	1,3	100/200	22.9 (South)
	60	1	105/210	
	60	1,3	220/380	
Kuwait	50	1,3	240/415	NA
Laos	50	1,3	220/380	6.6, 22
Lebanon				11, 15, 33*
Tripoli	50	1,3	110/190 220/380	
Zahleh	50	1,3	220/380	
All Other	50	1,3	110/190	
Lesotho	50	1,3	120/240 120/208	11, 33
Liberia	60	1,3	120/240 120/208	7.2, 12.5
Libya				NA
Barce	50	1,3	230/400	
Benghazi	50	1,3	230/400	
Darnah	50	1,3	230/400	
Al Bayda	50	1,3	230	
Sebha	50	1	230	
Tubruq	50	1,3	230/400	
All Other	50	1,3	127/220	

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Luxembourg	50	1,3	120/208 220/380	5, 15, 20, 65
Macau	50	1,3	220/380	11
Macedonia	NA	NA	NA	6.6, 10
Madagascar				5, 20, 35*
Ambatolampy	50	1,3	220/380	
Ambatondrazaka	50	1,3	220/380	
Tulear	50	1,3	220/380	
All Others	50	1,3	127/220 220/380	
Majorca Island	50	1,3	127/220 220/380	NA
Malawi	50	1,3	230/400	3.3, 11, 33, 66
Malaysia	50	1,3	240/415	6.6, 11, 22, 33
Maldives	50	1,3	230/400	11
Mali, Republic of	50	1,3	220/380	15, 30
Malta	50	1,3	240/415	6, 11
Martinique	50	1,3	220	NA
Mauritius	50	1,3	230/400	6.5, 22
Mexico	60	1,3	127/220	6.6, 13.2, 13.8, 23, 34.5, 44, 69
Monaco	50	1,3	127/220 220/380	10, 20
Montserrat	60	1,3	230/400	NA

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Morocco				5.5, 20, 22*
Agadir	50	1,3	127/220 220/380	
Beni-Mellal	50	1,3	127/220 220/380	
EI-Hoceima	50	1,3	220/380	
Khemisset	50	1,3	220/380	
Khenifra	50	1,3	220/380	
Oued-Zem	50	1,3	127/220 220/380	
Sidi Kacem	50	1,3	127/220 220/380	
Sidi Slimane	50	1,3	127/220 220/380	
Souk-El-Arba Gharb	50	1,3	127/220 220/380	
All Others	50	1,3	127/220	
Mozambique	50	1,3	220/380	6.6, 11, 22, 33
Myanmar/Burma	50	1,3	230/400	3.3, 6.6, 11, 33
Nepal	50	1,3	220/440	11, 33
Netherlands				5.3, 6, 10, 12.5, 20, 25*
Amsterdam	50	1,3	220/380 220	
Delft	50	1,3	220/380 220	
All Others	50	1,3	220/380	
Netherlands Antilles				NA
Aruba:				
Lago Colony	60	1	115/230	
Oranjestad	60	1,3	127/220	
San Nicolas	60	1,3	127/220	
Bonaire:				
Kralendijk	50	1,3	127/220	
Curacao:				
Emmastad	50	1,3	223/380	
Willemstad	50	1,3	127/220	
St. Martin:				
Philipsburg	60	1,3	120/208	
New Caledonia	50	1,3	220/380	NA

* Voltages listed are country-inclusive, all voltages listed for the country may not be found in individual cities listed.

Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
New Zealand	50	1,3	230/400	11
Nicaragua	60	1,3	120/240	13.8, 24.9
Niger	50	1,3	220/380	5.5, 15, 20
Nigeria	50	1,3	230/415	11, 33
Norway	50	1,3	230	NA
Okinawa				NA
Military Facilities	60	1	120/240	
All Cities	60	1	100/200	
Oman	50	1,3	240/415	11, 33
Pakistan				11, 33
Hyderabad	50	1,3	220/380	
Karachi	50	1,3	220/380	
All Others	50	1,3	230/400	
Panama				11, 12, 34.5*
Colon	60	1,3	115/230	
Panama City	60	1,3	115/230	
			126/208	
Puerto Armuelles	60	1,3	120/240	
All Others	60	1,3	110/220	
Papua New Guinea	50	1,3	240/415	11, 22
Paraguay	50	1,3	220/380	23
Peru				5, 10, 20, 30*
Arequipa	50	1,3	220	
Talara	60	1,3	110/220	
All Others	60	1,3	220	
Philippines				2.4, 4.8, 6.24, 7.62, 13.2, 13.8, 34.5*
Manila	60	1,3	115/230	
			110/220	
All Others	60	1,3	110/220	
Poland	50	1,3	220/380	6, 15, 20, 30, 40, 60
Portugal	50	1,3	220/380	6, 10, 15, 30, 40, 60
Puerto Rico	60	1,3	120/240	4.16, 13.2
Qatar	50	1,3	240/415	11
Romania	50	1,3	220/380	6, 10, 20

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Russia	50	1,3	220/380	NA
Rwanda	50	1,3	220/380	6.6, 15, 30
St. Kitts and Nevis	60	1,3	230/400	NA
St. Lucia	50	1,3	240/416	11
San Marino	NA	NA	NA	15
St. Vincent	50	1,3	230/400	6.3, 11, 33
Saudi Arabia				13.8, 33, 34.5, 69*
Al Khobar	60	1,3	127/220	
Buraydah	50	1,3	220/380	
Dammam	60	1,3	127/220	
Hufuf	50	1,3	230/400	
Jiddah	60	1,3	127/220	
Mecca	50	1,3	230/400	
Medina	60	1,3	127/220	
Riyadh	60	1,3	127/220	
Taif	50	1,3	230/400	
Senegal	50	1,3	127/20	5.5, 16.6, 30
Serbia	50	1,3	220/380	10, 20, 35
Seychelles	50	1,3	240	11
Sierra Leone	50	1,3	230/400	11
Singapore	50	1,3	230/400	6.6, 22
Slova Republic	NA	NA	NA	6, 10, 22, 35
Slovenia	NA	NA	NA	6.6, 10
Somalia				3, 15*
Berbera	50	1,3	230	
Brava	50	1,3	220/440	
Chisimaio	50	1,3	220	
Hargeysa	50	1,3	220	
Marka	50	1,3	120/220	
Mogadishu	50	1,3	220/380	

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
South Africa/Namibia				6.6 , 11 , 22 , 33*
Beaufort West	50	1,3	230/400	
Benoni	50	1,3	230/400	
Boksburg	50	1,3	230/400	
Cradock	50	1,3	230/400	
Germiston	50	1,3	230/400	
Grahaamstad	50	1,3	250/430	
Keetmanshoop	50	1,3	230/400	
King Williams	50	1,3	220/380 250/433	
Klerksdorp	50	1,3	230/400	
Kroonstad	50	1,3	230/400	
Paarl	50	1,3	230/400	
Port Elizabeth	50	1,3	250/433	
Pretoria	50	1,3	240/415	
Roodepoort	50	1,3	230/400	
Somerset West	50	1,3	230/400	
Springs	50	1,3	220/380 230/400	
Stellenbosch	50	3	220/380	
Umtata	50	1,3	230/400	
Upington	50	1,3	230/400	
Virginia	50	1,3	230/400	
Vryheid	50	1,3	230/400	
Walvis Bay	50	1,3	230/400	
Wellington	50	1,3	230/400	
Worcester	50	1,3	230/400	
All Others	50	1,3	220/380	
Spain	50	1,3	127/220 220/380	3, 6.6, 10, 11.6, 15, 20, 33
Sri Lanka	50	1,3	230/400	11, 33
Sudan	50	1,3	240/415	11, 33
Suriname	60	1,3	115/230	33
Swaziland	50	1,3	230/400	11, 33
Sweden	50	1,3	220/380	3, 6, 7, 10, 20, 30
Switzerland	50	1,3	220/380	1, 16, 50
Syria	50	1,3	220/380	20
Tahiti	60	1,3	127/220	4.8, 14.4, 20

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Taiwan	60	1,3	110/220	2.3, 3.3, 5.9, 11.4, 22.8
Tanzania	50	1,3	230/400	11, 33
Thailand	50	1,3	220/380	3.5, 11, 12, 22, 24, 33
Togo				5.5 , 20 , 33*
Lome	50	1,3	127/220 220/380	
All Others	50	1,3	220/380	
Tonga	50	1,3	240/415	11
Trinidad and Tobago	60	1,3	115/230 230/400	6.6, 12
Tunisia				10, 15, 30*
Ariana	50	1,3	127/220 220/380	
Bardo	50	1,3	127/220 220/380	
Beja	50	1,3	127/220	
Bizerte	50	1,3	127/220	
Carthage	50	1,3	127/220	
Gafsa	50	1,3	127/220 220/380	
Hammam-Lif	50	1,3	127/220	
Kairouan	50	1,3	127/220	
La Goulette	50	1,3	127/220	
La Manouba	50	1,3	127/220	
La Marsa	50	1,3	127/220	
Mateur	50	1,3	127/220	
Menzel Bourguiba	50	1,3	127/220	
Sfax	50	1,3	127/220 220/380	
Sousse	50	1,3	127/220	
Tunis	50	1,3	127/220 220/380	
All Others	50	1,3	220/380	
Turkey				6.3 , 10.5, 15, 34.5*
Istanbul	50	1,3	110/220 220/380	
All Others	50	1,3	220/380	
Uganda	50	1,3	240/415	11, 33

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
United Arab Emirates				6,6, 11, 33*
Abu Dhabi	50	1,3	240/415	
Ajman	50	1,3	230/400	
Dubai	50	1,3	220/380	
United Kingdom:				
England	50	1	240/480	3.5, 6.6, 11, 22, 33, 66
		3	240/415	
Scotland	50	1,3	240/415	6.6, 11, 22, 33
Northern Ireland	50	1,3	220/380 230/400	6.6, 11, 33
United States of America	60	1,3	120/240 120/208	2.4, 4.16, 4.8, 6.9, 8.32, 12, 12.47, 13.2, 13.8, 14.4, 19.9, 20.8, 22.86, 23, 24.94, 34.5, 46, 69
Upper Volta	50	1,3	220/380	NA
Uruguay	50	1,3	220	6, 15, 30, 60
Venezuela	60	1,3	120/240	2.4, 4.16, 4.8, 12.47, 13.8
Vietnam				6.6 (south)
Ban Me Thout	50	1,3	220/380	10 (north)
Can Tho	50	1,3	127/220 220/380	15 (middle) 35 (entire)
Dalat	50	1,3	120/208 220/380	
Da Nang	50	1,3	127/220	
Hue	50	1,3	127/220	
Khanh Hung	50	1,3	220/380	Note: State has plans to change to 22 kV for whole coun- try.
Saigon	50	1,3	120/208 220/380	
Virgin Islands	60	1,3	120/240	NA
Western Samoa	50	1,3	230/400	6.6, 22
Yemen	50	1,3	250/440	NA
Zaire	50	1,3	220/380	6.6, 15, 20, 30
Zambia	50	1,3	220/380	11, 33, 66

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Country/City	Frequency (Hz)	Number of Phases	Low Voltage (V)	Medium Voltage (kV)
Zimbabwe				11, 22, 33, 66*
Bulawayo	50	1,3	230/400	
All Others	50	1,3	220/380	

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Appendix B: Listing of 50 Hz Equipment, Manufacturers, and Vendors

ELECTRICAL EQUIPMENT

E104XX - Switches

E10400 - Toggle Switches

Cooper Industries Inc./Arrow-Hart Component Products Division
103 Hawthorn Street Hartford, CT 06105 203/249-8471
POC: Kathy Krol
Rep: Eaton Corporation Milwaukee, WI 414/449-7780

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

Square D Co./Consumer Products Division 1870 Roselle Road
Hillcrest Commons Schaumberg, IL 60195
708/397-9559 Fax: 708/397-8814
POC: Doug Atkinson
Rep: Square D Company Champaign, IL 217/356-0211

E10410 - Dimmer Switches

Cooper Industries Inc./Arrow-Hart Component Products Division
103 Hawthorn Street Hartford, CT 06105 203/249-8471
POC: Kathy Krol
Rep: Eaton Corporation Milwaukee, WI 414/449-7780

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

Valmont Electric Inc. 1430 East Fairchild Street
Danville, IL 61832 217/446-4600 Fax: 217/431-5740
POC: Knox Wilkie

E10420 - Explosionproof Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Janco Corporation 3111-T Winona Avenue Burbank, CA 91504
818/846-1800 Fax: 818/842-3396
POC: Paul Gerritse

Micro Switch/Honeywell Division 11 West Spring Street
Freeport, IL 61032 815/235-6600 Fax: 815/235-6545
POC: Dave Hill

Square D Co./Consumer Products Division 1870 Roselle Road
Hillcrest Commons Schaumburg, IL 60195
708/397-9559 Fax: 708/397-8814
POC: Doug Atkinson
Rep: Square D Company Champaign, IL 217/356-0211

E10430 - Disconnect Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Boltswitch Inc. 6107 W. Lou Avenue Crystal Lake, IL 60014
815/459-6900 Fax: 815/455-7788
POC: Dick Rahn

Bridges Electric Inc. Industrial Park Hwy. 110 East P.O. Box 511
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

E10440 - Control Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Boltswitch Inc. 6107 W. Lou Avenue Crystal Lake, IL 60014
815/459-6900 Fax: 815/455-7788
POC: Dick Rahn

Bridges Electric Inc. Industrial Park Hwy. 110 East P.O. Box 511
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

E10450 - Contactor Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Boltswitch Inc. 6107 W. Lou Avenue Crystal Lake, IL 60014
815/459-6900 Fax: 815/455-7788
POC: Dick Rahn

Bridges Electric Inc. Industrial Park Hwy. 110 East P.O. Box 511
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

E10460 - Relay Switches

Beckwith Electric Co. Inc. P.O. Box 2999 Largo, FL 34649-2999
813/535-3408 Fax: 813/546-0121
POC: Jim Harlow

Cooper Industries Inc./Arrow-Hart Component Products Division
103 Hawthorn Street Hartford, CT 06105 203/249-8471
POC: Kathy Krol
Rep: Eaton Corporation Milwaukee, WI 414/449-7780

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E10470 - Safety Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Boltswitch Inc. 6107 W. Lou Avenue Crystal Lake, IL 60014
815/459-6900 Fax: 815/455-7788
POC: Dick Rahn

Bridges Electric Inc. Industrial Park Hwy. 110 East P.O. Box 511
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

E10480 - Time Switches

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Boltswitch Inc. 6107 W. Lou Avenue Crystal Lake, IL 60014
815/459-6900 Fax: 815/455-7788
POC: Dick Rahn

Bridges Electric Inc. Industrial Park Hwy. 110 East P.O. Box 511
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

E106XX - Motor Starters**E10600 - Unfused Starters**

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettlers

E10610 - Fused Starters

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E10620 - With Circuit Breaker

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E107XX - Fuses

E10700 - Fuses

Cooper Industries/Cooper Power Systems/McGraw-Edison Power Systems
P.O. Box 2850 Pittsburgh, PA 15230
412/269-6700 Fax: 412/269-6761
POC: Gary Patterson
Rep: Vikeland Sales Inc. Addison, IL 708/832-8425

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

S and C Electric Co. 6601 North Ridge Boulevard
Chicago, IL 60626 312/338-1000
POC: Bob Tucker
Rep: S and C Electric Co. St. Louis, MO 314/997-6440

Square D Co./Consumer Products Division 1870 Roselle Road
Hillcrest Commons Schaumberg, IL 60195
708/397-9559 Fax: 708/397-8814
POC: Doug Atkinson
Rep: Square D Company Champaign, IL 217/356-0211

E10710 - Fuse Cabinets

Cooper Industries/Cooper Power Systems/McGraw-Edison Power Systems
P.O. Box 2850 Pittsburgh, PA 15230
412/269-6700 Fax: 412/269-6761
POC: Gary Patterson
Rep: Vikeland Sales Inc. Addison, IL 708/832-8425

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

S and C Electric Co. 6601 North Ridge Boulevard
Chicago, IL 60626 312/338-1000
POC: Bob Tucker
Rep: S and C Electric Co. St. Louis, MO 314/997-6440

Square D Co./Consumer Products Division 1870 Roselle Road
Hillcrest Commons Schaumburg, IL 60195
708/397-9559 Fax: 708/397-8814
POC: Doug Atkinson
Rep: Square D Company Champaign, IL 217/356-0211

E109XX - Meter Centers and Sockets**E10900 - Miscellaneous**

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Durham Company P.O. Box 908 Lebanon, MO 65536
417/532-7121 Fax: 417/532-2366
POC: John Chastain

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E110XX - Panelboards**E11000 - Miscellaneous**

Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7004 Fax: 315/477-5717
POC: Carol Messinger

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E111XX - Circuit Breakers

E11100 - Miscellaneous

A.S.C. Industries Inc./Power Distribution Group
8967 Pleasantwood Avenue N.W. P.O. Box 2523
North Canton, OH 44720-0523 216/499-1210 Fax: 216/499-1213
POC: Mike Rice

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E112XX - Switchboards

E12000 - No Main Disconnect Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fetter

E12010 - Fused Switch and CT Compartment Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fetter

E12020 - Pressure Switch and CT Compartment Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fetter

E12030 - Circuit Breaker, Molded Case, and CT Compartment Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Durham Company P.O. Box 908 Lebanon, MO 65536
417/532-7121 Fax: 417/532-2366
POC: John Chastain

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fetter

E113XX - Switchboard Instruments**E11300 - AC Indicating, Ammeter and Switch**

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11310 - Voltmeters and Switches for Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11320 - Wattmeters for Switchboards

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E114XX - Motors**E11400 - Miscellaneous**

Bogue Electric Manufacturing Co. 100 Pennsylvania Avenue
Paterson, NJ 07509 201/523-2200 Fax: 201/279-2973
POC: Joseph DeCeglia

General Electric Co./Industry Sales and Services Division
1 River Road Schenectady, NY 12345 518/385-2211
POC: Gerry Engardio
Rep: Dreisilher Electric Motors Glen Ellyn, IL 708/469-7510

Scott Fetzer Co./France Division 726 Fairview Blvd.
Fairview, TN 37062 615/799-0551
POC: Bernhard Braeuner

E115XX - Transformers

E11500 - Buck-Boost Transformer

Acme Electric/Acme Transformer Division 4815 West 5th Street
Lumberton, NC 28358 919/738-1121 Fax: 919/739-0024
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11510 - Dry Type Transformers

Acme Electric/Acme Transformer Division 4815 West 5th Street
Lumberton, NC 28358 919/738-1121 Fax: 919/739-0024
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Company 41 Woodford Avenue
Plainville, CT 06062 309/664-1474
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11520 - Isolating Transformers

Acme Electric/Acme Transformer Division 4815 West 5th Street
Lumberton, NC 28358 919/738-1121 Fax: 919/739-0024
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11530 - Oil Filled Transformers

A.B.B Power Transmission and Distribution Highway 58 West
South Boston, VA 24592 804-575-2211 Fax:
POC: Dick Stoakley
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

Niagra Transformer 1751 Dale Road
Buffalo, NY 14225 716/896-6500 Fax: 716/896-8871
POC: Bill Hanavan

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E11540 - Silicon Filled Transformers

A.B.B Power Transmission and Distribution Highway 58 West
South Boston, VA 24592 804-575-2211 Fax:
POC: Dick Stoakley
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

Niagra Transformer 1751 Dale Road
Buffalo, NY 14225 716/896-6500 Fax: 716/896-8871
POC: Bill Hanavan

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E117XX - Computer Power Supplies**E11700 - Automatic Voltage Regulators**

Computer Power Inc. 124 West Main Street
High Bridge, NJ 08829 908/638-8000 Fax: 908/638-4931
POC: Tom Schreffler

General Signal Corporation/Sola Division 1717 Busse Road
Elk Grove Village, IL 60007 708/439-2800 Fax: 708/439-1160
POC: Tom McCaughn

Reliance Electric Co./Kato Engineering Co. 2075 Howard Drive
Mankato, MN 56001 507/625-4011 Fax: 507/345-2798
POC: Larry Sieberg

E11710 - Isolation Transformer - Computer Grade

Computer Power Inc. 124 West Main Street
High Bridge, NJ 08829 908/638-8000 Fax: 908/638-4931
POC: Tom Schreffler

Controlled Power Co. 1955 Stephenson Highway Troy, MI 48083
313/528-3700 Fax: 313/528-0411
POC: Ed Reschka

Rapid Power Technologies Inc. Graysbridge Road
Brookfield, CT 06804 203/775-0411 Fax: 203/775-0666
POC: Fred Eigenrauch

E11720 - Transient Voltage Suppressor Transformer

Computer Power Inc. 124 West Main Street
High Bridge, NJ 08829 908/638-8000 Fax: 908/638-4931
POC: Tom Schreffler

Controlled Power Co. 1955 Stephenson Highway Troy, MI 48083
313/528-3700 Fax: 313/528-0411
POC: Ed Reschka

Rapid Power Technologies Inc. Graysbridge Road
Brookfield, CT 06804 203/775-0411 Fax: 203/775-0666
POC: Fred Eigenrauch

E11730 - Computer Regulator Transformer

Computer Power Inc. 124 West Main Street
High Bridge, NJ 08829 908/638-8000 Fax: 908/638-4931
POC: Tom Schreffler

Controlled Power Co. 1955 Stephenson Highway Troy, MI 48083
313/528-3700 Fax: 313/528-0411
POC: Ed Reschka

Rapid Power Technologies Inc. Graysbridge Road
Brookfield, CT 06804 203/775-0411 Fax: 203/775-0666
POC: Fred Eigenrauch

E11740 - Power Conditioning Transformer

Computer Power Inc. 124 West Main Street
High Bridge, NJ 08829 908/638-8000 Fax: 908/638-4931
POC: Tom Schreffler

Controlled Power Co. 1955 Stephenson Highway Troy, MI 48083
313/528-3700 Fax: 313/528-0411
POC: Ed Reschka

Rapid Power Technologies Inc. Graysbridge Road
Brookfield, CT 06804 203/775-0411 Fax: 203/775-0666
POC: Fred Eigenrauch

E118XX - Power Systems

E11800 - Automatic Transfer Switches

Asco Controls/Automatic Switch Company 50-60 Hanover Road
Florham Park, NJ 07932 201/966-2000 Fax: 201/966-2628
POC: Henry Dacko
Rep: Automatic Switch Company Elk Grove, IL 708/640-3450

Caterpillar Inc. 100 N.E. Adams Street Peoria, IL 61629
309/675-1000 Fax: 309/675-6155
POC: Bob Kilper

Cyberex Inc. 7171 Industrial Park Blvd. Mentor, OH 44060
216/946-1783 Fax: 216/946-5963
POC: Ed Meluch

E118010 - Non-automatic Transfer Switches

Asco Controls/Automatic Switch Company 50-60 Hanover Road
Florham Park, NJ 07932 201/966-2000 Fax: 201/966-2628
POC: Henry Dacko
Rep: Automatic Switch Company Elk Grove, IL 708/640-3450

Caterpillar Inc. 100 N.E. Adams Street Peoria, IL 61629
309/675-1000 Fax: 309/675-6155
POC: Bob Kilper

Cyberex Inc. 7171 Industrial Park Blvd. Mentor, OH 44060
216/946-1783 Fax: 216/946-5963
POC: Ed Meluch

E11820 - Generator Set

Bogue Electric Manufacturing Co. 100 Pennsylvania Avenue
Paterson, NJ 07509 201/523-2200 Fax: 201/279-2973
POC: Joseph DeCeglia

Caterpillar Inc. 100 N.E. Adams Street Peoria, IL 61629
309/675-1000 Fax: 309/675-6155
POC: Bob Kilper

Cresswood Industrial Furnaces 4504-T Ellwalk Ave. Cortland, IL 60112
800-962-7302 Ext. 71
POC: Larry Reiling

Dresser Rand Co./Steam Turbine, Motor and Generator Division
800 Central Avenue Minneapolis, MN 55413-2403
612/378-8000 Fax: 612/378-8050
POC: Tim Spence

E11830 - Line Poles, Towers, and Overhead Line Conductors

A.B. Chance Co. 210 North Allen Street
Centralia, MO 65240-1395 314/682-5521
POC: Joe Johnson

Bridges Electric Inc. Industrial Park Hwy. 110 East
Heber, AR 72543 501/362-8296 Fax: 501/362-6970
POC: John Jones

Lapp Insulator Co./Power Structures Inc. P.O. Box 6261
New Orleans, LA 70174 504/394-7433 Fax: 504/391-9692
POC: Pat Deloney

Lindsey Manufacturing Co. 760 North Georgia Avenue
Azusa, CA 91702 818/969-3471 Fax: 818/969-3177
POC: Jiji Smith

E11840 - Substation Equipment

Challenger Electrical Equipment Corp. 508 Lapp Road
Malvern, PA 19355 215/647-5000 Fax: 215/640-0568
POC: Rose Harris
Rep: Challenger Electrical Elk Grove Village, IL 708/595-3840

General Electric Co./Industry Sales and Services Division
1 River Road Schenectady, NY 12345 518/385-2211
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Square D Co./Distribution Equipment Division
1601 Mercer Road Lexington, KY 40511 606/254-6412
POC: Doug Atkinson
Rep: Square D Company Champaign, IL 217/356-0211

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E119XX - Capacitors**E11900 - Indoor**

Cooper Industries/Cooper Power Systems/McGraw-Edison Power Systems
P.O. Box 2850 Pittsburgh, PA 15230
412/269-6700 Fax: 412/269-6761
POC: Gary Patterson
Rep: Vikeland Sales Inc. Addison, IL 708/832-8425

General Electric Co./Industry Sales and Services Division
1 River Road Schenectady, NY 12345 518/385-2211
POC: Warren Molitor
Rep: General Electric Co. Bloomington, IL 309/664-1474

Westinghouse Electric Supply Co. 603 North Gilbert Street
Danville, IL 61832 217/442-1901 Fax: 217/442-7317
POC: Butch Fettters

E120XX - Exit and Emergency Lighting**E12000 - Exit Light - Single Face - Incandescent**

Chloride Systems/Lighting Alliance 4415 West Harrison Street
Suite 234 Hillside, IL 60162
708/449-8822 Fax: 708/449-8835
POC: Ed Vormann

Cornerstone Direct Corp./Ready Made Sign Co. Inc. 480 Fillmore Ave.
Tonawanda, NY 14151 716/695-7300 Fax: 800/222-1934
POC: Dan Howes

Dual-Lite Inc. Simm Lane P.O. Box 468 Newtown, CT 06470
203/426-8011 Fax: 203/426-7486
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

E12010 - Exit Light - Single Face - Fluorescent

Chloride Systems/Lighting Alliance 4415 West Harrison Street
Suite 234 Hillside, IL 60162
708/449-8822 Fax: 708/449-8835
POC: Ed Vormann

Cornerstone Direct Corp./Ready Made Sign Co. Inc. 480 Fillmore Ave.
Tonawanda, NY 14151 716/695-7300 Fax: 800/222-1934
POC: Dan Howes

Dual-Lite Inc. Simm Lane P.O. Box 468 Newtown, CT 06470
203/426-8011 Fax: 203/426-7486
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

E12020 - Exit Light - Double Face - Incandescent

Chloride Systems/Lighting Alliance 4415 West Harrison Street
Suite 234 Hillside, IL 60162
708/449-8822 Fax: 708/449-8835
POC: Ed Vormann

Cornerstone Direct Corp./Ready Made Sign Co. Inc. 480 Fillmore Ave.
Tonawanda, NY 14151 716/695-7300 Fax: 800/222-1934
POC: Dan Howes

Dual-Lite Inc. Simm Lane P.O. Box 468 Newtown, CT 06470
203/426-8011 Fax: 203/426-7486
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

E12030 - Exit Light - Double Face - Fluorescent

Chloride Systems/Lighting Alliance 4415 West Harrison Street
Suite 234 Hillside, IL 60162
708/449-8822 Fax: 708/449-8835
POC: Ed Vormann

Cornerstone Direct Corp./Ready Made Sign Co. Inc. 480 Fillmore Ave.
Tonawanda, NY 14151 716/695-7300 Fax: 800/222-1934
POC: Dan Howes

Dual-Lite Inc. Simm Lane P.O. Box 468 Newtown, CT 06470
203/426-8011 Fax: 203/426-7486
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

E12040 - Emergency Light Units - Battery Operated
Chloride Systems/Lighting Alliance 4415 West Harrison Street
Suite 234 Hillside, IL 60162
708/449-8822 Fax: 708/449-8835
POC: Ed Vormann

Cornerstone Direct Corp./Ready Made Sign Co. Inc. 480 Fillmore Ave.
Tonawanda, NY 14151 716/695-7300 Fax: 800/222-1934
POC: Dan Howes

Dual-Lite Inc. Simm Lane P.O. Box 468 Newtown, CT 06470
203/426-8011 Fax: 203/426-7486
POC: Patti Grimmet
Rep: Electri Agency Inc. Elk Grove, IL 708/439-5030

E121XX - Light Fixtures

E12100 - External Incandescent Light Fixtures
Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Corbett Lighting Inc. 2727 Northhaven Road Dallas, TX 75229
214/241-8800 Fax: 214/241-4239
POC: Dave Meyer
Rep: Total Lighting Concepts Hillside, IL 708/449-2022
Prescolite/U.S.I. Lighting 1251 Doolittle Drive
San Leandro, CA 94577 415/562-3500
POC: Mark Benguerel

E12110 - External Sodium and Mercury Vapor Light Fixtures
Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Lumark Lighting/Cooper Lighting 400 Busse Road
Elk Grove Village, IL 60007
312/956-8400 Fax: 312/956-1537
POC: James Byrket
Rep: Westinghouse Supply Co. Danville, IL 217/442-1901

Prescolite/U.S.I. Lighting 1251 Doolittle Drive
San Leandro, CA 94577 415/562-3500
POC: Mark Benguerel

E12120 - Internal Incandescent Light Fixtures
Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Corbett Lighting Inc. 2727 Northhaven Road Dallas, TX 75229
214/241-8800 Fax: 214/241-4239
POC: Dave Meyer
Rep: Total Lighting Concepts Hillside, IL 708/449-2022

Prescolite/U.S.I. Lighting 1251 Doolittle Drive
San Leandro, CA 94577 415/562-3500
POC: Mark Benguerel

E12130 - Internal Fluorescent, Metal Halide, and Sodium Light Fixtures
Appleton Electric Co. 1701 W. Wellington Ave. Chicago, IL 60657
312/327-7200 Fax: 312/975-6349
POC: Terese McGary

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Lumark Lighting/Cooper Lighting 400 Busse Road
Elk Grove Village, IL 60007
312/956-8400 Fax: 312/956-1537
POC: James Byrket
Rep: Westinghouse Supply Co. Danville, IL 217/442-1901

Prescolite/U.S.I. Lighting 1251 Doolittle Drive
San Leandro, CA 94577 415/562-3500
POC: Mark Benguerel

E123XX - Time System Components

E12300 - Clocks, Bells, Master Controller, Frequency Generator

Eagle Electric Manufacturing Co. Inc. 45-31 Court Square
Long Island City, NY 11101 718/937-8000 Fax: 718/482-0160
POC: Harlan Berman

Electric Time Co. Inc. 45 West Street Medfield, MA 02052
508/359-4396 Fax: 508/359-4482
POC: Tom Erb

Nu Tone Inc. Madison and Red Bank Roads
Cincinnati, OH 45227 513/527-5100
POC: Mike Walsh

Simplex Time Recorder Co. Simplex Plaza
Gardner, MA 01441-0001 508/632-2500
POC: Dave Ringland
Rep: Simplex Time Recorder Co. East Peoria, IL 309/694-8000

E124XX - Detection Systems (Except Fire)**E12400 - Burglar Alarm Systems**

Burle Industries Inc./Security Products 1000 New Holland Avenue
Lancaster, PA 17601-5688 717/295-6123 Fax: 717/295-6097
POC: Steve Neil

Detection Systems Inc. 130 Perinton Parkway
Fairport, NY 14450 716/223-4060 Fax: 716/223-9180
POC: Jeff Matrachisia

Monaco Enterprises Inc. East 14820 Sprague Avenue
Spokane, WA 99214-0129 509/926-6277 Fax: 509/924-4980
POC: Dan Long

Pittway Corporation/Ademco Division 180 Michael Drive
Syosset, NY 11791 516/921-6700 Fax: 516/921-6700
POC: Tony Franco

Racon Incorporated 12628 Interurban Avenue South
Seattle, WA 98168 206/241-1110 Fax: 206/246-9306
POC: Tim Tewey

E12410 - Doorbell Systems

Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
Wolf and 7th North Streets P.O. Box 4999 Syracuse, NY 13221
315/477-7000 Fax: 315/477-5717
POC: Carol Messinger

Monaco Enterprises Inc. East 14820 Sprague Avenue
Spokane, WA 99214-0129 509/926-6277 Fax: 509/924-4980
POC: Dan Long

Nu Tone Inc. Madison and Red Bank Roads
Cincinnati, OH 45227 513/527-5100
POC: Mike Walsh

Pittway Corporation/Ademco Division 180 Michael Drive
Syosset, NY 11791 516/921-6700 Fax: 516/921-6700
POC: Tony Franco

E12420 - Surveillance

Burle Industries Inc./Security Products 1000 New Holland Avenue
Lancaster, PA 17601-5688 717/295-6123 Fax: 717/295-6097
POC: Steve Neil

Nu Tone Inc. Madison and Red Bank Roads
Cincinnati, OH 45227 513/527-5100
POC: Mike Walsh

Wells Fargo Security Products 1010 North Glebe Road
Arlington, VA 22201 703/247-4250
POC: Dallas Steele

E127XX - P.A. and Sound Systems

E12700 - Public Address Systems

Paso Sound Products Inc. 14 First Street
Pelham, NY 10803-1495 914/738-4800 Fax: 914/738-3954
POC: Ken O'Brien

Rauland-Borg Corp. 3450 West Oakton Street
Skokie, IL 60076-2951 708/679-0900 Fax: 708/679-0625
POC: Bill Martin
Rep: Life Safety Design Danville, IL 217/446-2564

Three M Co.(3M)/Sound Products 3M Center Building 551-1W-01
St. Paul, MN 55144-1000 612/733-9214 Fax: 612/736-7614
POC: Paul Nitschke

E12710 - Intercoms

Nu Tone Inc. Madison and Red Bank Roads
Cincinnati, OH 45227 513/527-5100
POC: Mike Walsh

Paso Sound Products Inc. 14 First Street
Pelham, NY 10803-1495 914/738-4800 Fax: 914/738-3954
POC: Ken O'Brien

Rauland-Borg Corp. 3450 West Oakton Street
Skokie, IL 60076-2951 708/679-0900 Fax: 708/679-0625
POC: Bill Martin
Rep: Life Safety Design Danville, IL 217/446-2564

Three M Co.(3M)/Sound Products 3M Center Building 551-1W-01
St. Paul, MN 55144-1000 612/733-9214 Fax: 612/736-7614
POC: Paul Nitschke

E12720 - Emergency Call Systems

Nu Tone Inc. Madison and Red Bank Roads
Cincinnati, OH 45227 513/527-5100
POC: Mike Walsh

Paso Sound Products Inc. 14 First Street
Pelham, NY 10803-1495 914/738-4800 Fax: 914/738-3954
POC: Ken O'Brien

Rauland-Borg Corp. 3450 West Oakton Street
Skokie, IL 60076-2951 708/679-0900 Fax: 708/679-0625
POC: Bill Martin
Rep: Life Safety Design Danville, IL 217/446-2564

Three M Co.(3M)/Sound Products 3M Center Building 551-1W-01
St. Paul, MN 55144-1000 612/733-9214 Fax: 612/736-7614
POC: Paul Nitschke

E12730 - Sound System Components

Paso Sound Products Inc. 14 First Street
Pelham, NY 10803-1495 914/738-4800 Fax: 914/738-3954
POC: Ken O'Brien

Rauland-Borg Corp. 3450 West Oakton Street
Skokie, IL 60076-2951 708/679-0900 Fax: 708/679-0625
POC: Bill Martin
Rep: Life Safety Design Danville, IL 217/446-2564

Three M Co.(3M)/Sound Products 3M Center Building 551-1W-01
St. Paul, MN 55144-1000 612/733-9214 Fax: 612/736-7614
POC: Paul Nitschke

E12740 - House Telephone System

Comdial Corporation 1180 Seminole Trail
Charlottesville, VA 22906
800/347-1432 Fax: 804/978-2293
POC: Frank Feliciano

Cortelco Inc./I.T.T. Telephones
Fulton Drive Corinth, MS 38834
601/287-5281 Fax: 601/287-1473
POC: Mark Daniel

Motorola Inc. 1475 West Shure Drive
Arlington Heights, IL 60004
708/632-5000 Fax: 708/632-6034
POC: Marge Seda

E129XX - Fire Alarm Equipment**E12900 - Miscellaneous**

Detection Systems Inc. 130 Perinton Parkway
Fairport, NY 14450 716/223-4060 Fax: 716/223-9180
POC: Jeff Matrachisla

Fire-Lite Alarms Inc. 12 Clintonville Road
Northford, CT 06472 203/484-7161 Fax: 203/484-7118
POC: Ray Weymann

Monaco Enterprises Inc. East 14820 Sprague Avenue
Spokane, WA 99214-0129 509/926-6277 Fax: 509/924-4980
POC: Dan Long

Pittway Corporation/Ademco Division 180 Michael Drive
Syosset, NY 11791 516/921-6700 Fax: 516/921-6700
POC: Tony Franco

Pittway Corporation/Notifier Division 12 Clintonville Road
Northford, CT 06472 800/289-3473 Fax: 203/484-7118
POC: Ray Weymann

E12910 - Smoke/Heat Detectors

Detection Systems Inc. 130 Perinton Parkway
Fairport, NY 14450 716/223-4060 Fax: 716/223-9180
POC: Jeff Matrachisia

Fire-Lite Alarms Inc. 12 Clintonville Road
Northford, CT 06472 203/484-7161 Fax: 203/484-7118
POC: Ray Weymann

Pittway Corporation/Ademco Division 180 Michael Drive
Syosset, NY 11791 516/921-6700 Fax: 516/921-6700
POC: Tony Franco

Pittway Corporation/Notifier Division 12 Clintonville Road
Northford, CT 06472 800/289-3473 Fax: 203/484-7118
POC: Ray Weymann

E13000 - Receptacles

International Configuration Inc.
P.O. Box 3374 Enfield, CT 06082
203-749-6380 Fax: 203-749-2985
POC: Harold Mitchell

Pass & Seymour/LeGrand 344 Carol Lane
Elmhurst, IL 60126 708-832-2500 Fax: 708-323-2524
POC: Jim Knapi

Panel Components Corp. P.O. Drawer 6626
Santa Rosa, CA 95406 707-534-0600 Fax: 707-578-5478
POC: Kim Eades

E13010 - Receptacles

International Configuration Inc.
P.O. Box 3374 Enfield, CT 06082
203-749-6380 Fax: 203-749-2985
POC: Harold Mitchell

Pass & Seymour/LeGrand 344 Carol Lane
Elmhurst, IL 60126 708-832-2500 Fax: 708-323-2524
POC: Jim Knapi

Panel Components Corp. P.O. Drawer 6626
Santa Rosa, CA 95406 707-534-0600 Fax: 707-578-5478
POC: Kim Eades

MECHANICAL EQUIPMENT**M100XX - Swimming Pools and Equipment****M10000 - Heaters**

Bryan Steam Corp PO Box 27 Peru, IN 46970
317-473-6651 Fax: 317-473-3074

POC: Bob Warren
Rep: Cummings-Wagner Annapolis, MD 301-490-9007

Coates Heater Co Inc 18250 68th Ave S Kent, WA 98032
206-872-7256 Fax: 206-251-0830
POC: Bob Wisenburg

Dumont Industries Main St PO Box 148 Monmouth, ME 04259
207-933-4811 Fax: 207-933-2649
POC: Greg Wilson

Electric Heater Co. 45 Seymour St PO Box 288 Stratford, CT 06497-0288
203-378-2659 Fax: 203-378-3593
POC: Bill Newbauer, Jr.

Great Lakes Chemical Corp/Hydrotech Chemical Corp PO Box 6549
Marietta, GA 30065-6549 404-952-2581 800-241-3303
Fax: 404-953-2109
POC: Chris Heflin / Gary McCoppin (Product Manager)

Little Giant Manufacturing Co Inc 907 7th St PO Box 518
Orange, TX 77630 409-883-4246 800-231-6035
POC: Alan McCorquodale

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Smith Corp/Smith Water Products Co 5605 Mac Arthur Blvd Suite 360
Irving, TX 75038 214-518-1990 800-527-1953 Fax: 214-518-1736
POC: Paul Woodward

M10010 - Underwater Lights

Genlyte Group Inc/Imperial Bronzelite 500 Wonder World Dr PO Box 606
San Marcos, TX 78666 512-392-5821 512-392-8957
Fax: 512-353-5822
POC: Clark Douglas

Great Lakes Chemical Corp/Hydrotech Chemical Corp PO Box 6549
Marietta, GA 30065-6549 404-952-2581 800-241-3303
Fax: 404-953-2109
POC: Gary McCoppin

Paddock Pool Equipment Co Inc 555 Paddock Pkwy PO Box 11676
Rock Hill, SC 29730 803-324-1111 Fax: 803-324-1116
POC: Eddie Graves

W M Hobbs, LTD 3786 Northeast Expressway Atlanta, GA 30340
404-457-3000
POC: Roger Graham

M10020 - Filters

ESSEF Industries Inc/Pac-Fab Inc 1620 Hawkins Ave Sanford, NC 27330
919-774-4151 800-833-3692 Fax: 919-774-4841
POC: Doug Stout

Great Lakes Chemical Corp/Hydrotech Chemical Corp PO Box 6549
Marietta, GA 30065-6549 404-952-2581 800-241-3303
Fax: 404-953-2109
POC: Gary McCoppin

Paddock Pool Equipment Co Inc 555 Paddock Pkwy PO Box 11676
Rock Hill, SC 29730 803-324-1111 Fax: 803-324-1116
POC: Eddie Graves

W M Hobbs, LTD 3786 Northeast Expressway Atlanta, GA 30340
404-457-3000
POC: Roger Graham

M101XX - Water Heaters**M10100 - Gas Fired Water Heaters**

Aldrich Co 341 E Williams St PO Box 97 Wyoming, IL 61491-0097
309-695-2311 Fax: 309-695-5779
POC: Ned Howard

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Mor-Flo Industries Inc/American Appliance Manufacturing Corp
PO Box 1956 Santa Monica, CA 90406 213-829-1755
Fax: 213-828-1940
POC: Jim Yerman

Rheem Manufacturing Co/Ruud Water Heater Div
5780 Peachtree-Dunwoody Road NE Atlanta, GA 30342
205-260-1500 800-432-8373
POC: Russel Maddox / Roger Clark

Smith Corp/Smith Water Products Co 5605 Mac Arthur Blvd Suite 360
Irving, TX 75038 214-518-1990 Fax: 214-518-1736
POC: Paul Woodward

State Industries Inc 500 By-Pass Rd Ashland City, TN 37015
615-792-4371 800-365-0024 Fax: 800-365-FAX2
POC: Ben Major

Weben-Jarco Inc 4007 Platinum Way PO Box 763460
Dallas, TX 75376-3460 214-637-0530 800-527-6449
Fax: 214-330-6864
POC: Doug Kinser
Rep: (Wash., D.C.) Steck Sales 301-948-7502

M10110 - Electric Water Heaters

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Mor-Flo Industries Inc/American Appliance Manufacturing Corp
PO Box 1956 Santa Monica, CA 90406 213-829-1755
Fax: 213-828-1940
POC: Jim Yerman

Rheem Manufacturing Co/Ruud Water Heater Div
5780 Peachtree-Dunwoody Road NE Atlanta, GA 30342
205-260-1500 800-432-8373
POC: Russell Maddox / Roger Clark

Smith Corp/Smith Water Products Co 5605 Mac Arthur Blvd Suite 360
Irving, TX 75038 214-518-1990 Fax: 214-518-1736
POC: Paul Woodward

State Industries Inc 500 By-Pass Rd Ashland City, TN 37015
615-792-4371 800-365-0024 Fax: 800-365-FAX2
POC: Ben Major

M10120 - Oil Fired Water Heaters

Aldrich Co 341 E Williams St PO Box 97 Wyoming, IL 61491-0097
309-695-2311 Fax: 309-695-5779
POC: Ned Howard

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Smith Corp/Smith Water Products Co 5605 Mac Arthur Blvd Suite 360
Irving, TX 75038 214-518-1990 Fax: 214-518-1736
POC: Paul Woodward

M102XX - Boilers**M10200 - Electric Boilers**

Bryan Steam Corp PO Box 27 Peru, IN 46970
317-473-6651 Fax: 317-473-3074
POC: Bob Warren
Rep: Cummings-Wagner Annapolis, MD 301-490-9007

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Marley Co/Weil-Mc Lain Blaine St Michigan City, IN 46360
219-879-6561
POC: Jim Wells / Jim Platt

Precision Parts Corp 4340 E Main St PO Box 2159 Morristown, TN 37814
615-587-9390 Fax: 615-581-7749
POC: Mark Cole

M10210 - Solid Fuel Boilers

Coppus Engineering Corp/Kewanee Boiler Co Inc 101 Franklin St
Kewanee, IL 61443 309-853-3541 Fax: 309-852-3541
POC: Rod Young
Rep: Fairbanks and Associates Arlington, VA 703-931-1313

Cresswood Industrial Furnaces 4504-T Ellwalk Ave. Cortland, IL 60112
800-962-7302 Ext. 71
POC: Larry Reiling

Industrial Boiler Company Inc. P.O. Drawer 2258 Thomasville, GA 31792
Thomasville, GA 31792 912-226-3024 Fax: 912-226-3027
POC: Mark Nesmith

M10220 - Oil Fired Boilers

Ajax Boiler Inc 17700 S. Main St Gardena, CA 90248
213-321-2815
POC: Larry Miracle

Aldrich Co 341 E Williams St. PO Box 97 Wyoming, IL 61491-0097
309-695-2311 Fax: 309-695-5779
POC: Ned Howard

Columbia Boiler Co Of Pottstown PO Box G Pottstown, PA 19464
215-323-2700
POC: Barry Loar

Coppus Engineering Corp/Kewanee Boiler Co Inc 101 Franklin St
Kewanee, IL 61443 309-853-3541 Fax: 309-852-3541
POC: Rod Young
Rep: Fairbanks and Associates Arlington, VA 703-931-1313

Crown Industries Inc 3633 I St Philadelphia, PA 19134
215-535-8900 Fax: 215-535-9736
POC: Paul Sohler

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis/Joe Beshar (V.P.)

Marley Co/Weil-Mc Lain Blaine St Michigan City, IN 46360
219-879-6561
POC: Jim Wells / Jim Platt

Parker Boiler Co 5930 Bandini Blvd Los Angeles, CA 90040-2999
213-727-9800 Fax: 213-722-2848
POC: Martin Bender / Greg Danenhauer

M10230 - Gas Fired Boilers

Ajax Boiler Inc 17700 S. Main St Gardena, CA 90248
213-321-2815
POC: Larry Miracle

Aldrich Co 341 E Williams St. PO Box 97 Wyoming, IL 61491-0097
309-695-2311 Fax: 309-695-5779
POC: Ned Howard

Bryan Steam Corp PO Box 27 Peru, IN 46970
317-473-6651 Fax: 317-473-3074
POC: Bob Warren
Rep: (Wash.. D.C.) Cummins-Wagner Annapolis, MD 301-490-9007

Columbia Boiler Co Of Pottstown PO Box G Pottstown, PA 19464
215-323-2700
POC: Barry Loar

Coppus Engineering Corp/Kewanee Boiler Co Inc 101 Franklin St
Kewanee, IL 61443 309-853-3541 Fax: 309-852-3541
POC: Rod Young
Rep: Fairbanks and Associates Arlington, VA 703-931-1313

Crown Industries Inc 3633 I St Philadelphia, PA 19134
215-535-8900 Fax: 215-535-9736
POC: Paul Sohler

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

Lochinvar Corp 2005 Elm Hill Park Nashville, TN 37210
615-889-8900 Fax: 615-885-4403
POC: Scott Armstrong

Marley Co/Weil-Mc Lain Blaine St Michigan City, IN 46360
219-879-6561
POC: Jim Wells

Parker Boiler Co 5930 Bandini Blvd Los Angeles, CA 90040-2999
213-727-9800 Fax: 213-722-2848
POC: Martin Bender / Greg Danenhauer

Precision Parts Corp 4340 E Main St PO Box 2159 Morristown, TN 37814
615-587-9390 Fax: 615-581-7749
POC: Mark Cole

Smith Corp/Smith Water Products Co 5605 Mac Arthur Blvd Suite 360
Irving, TX 75038 214-518-1990 Fax: 214-518-1736
POC: Paul Woodward

M103XX - Duct Heaters

M10300 - Duct Heaters

Emerson Electric Co/Wiegand Div 641 Alpha Drive Pittsburgh, PA 15238
412-967-3900
POC: Gary Ozegovich (Rep)
Rep: Faber-Renoff Baltimore, MD 301-768-4554

Hastings Industries Inc Hastings Industrial Pk E PO Box 548
Hastings, NE 68901-0548 402-463-9821
POC: Gary Brooks (Rep)
Rep: Brooks Co Bloomington, IL 309-452-2012

Reed National Corp/Sterling Radiator Div 260 N Elm St
Westfield, MA 01085 413-568-9571 Fax: 413-568-9613
POC: Cliff Greaves (Rep)
Rep: Cliff Greaves Co Washington, D.C. 919-288-3588

Stamm International Group/Powrmatic Inc 2906 Baltimore Blvd
Finksburg, MD 21048 301-833-9100 800-966-9100
Fax: 800-966-7971
POC: Frank McGready / Melvin Anderson (Pres.)

M104XX - Furnaces

M10400 - Hot Air Heating

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service 301-984-2400

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Steve / Tony

Reed National Corp/Sterling Alton, Applied Air Div 4830 Transport Dr
Dallas, TX 75247 214-638-6010 Fax: 214-638-2395
POC: Scott Stallings / Buddy Cross

Reed National Corp/Sterling Radiator Div 260 N Elm St
Westfield, MA 01085 413-568-9571 Fax: 413-568-9613
POC: Cliff Greaves (Rep)
Rep: Cliff Greaves Co Washington, D.C. 919-288-3588

Siebring Manufacturing Inc/Siebring Battery Div PO Box 658
George, IA 51237 712-475-3317 Fax: 712-475-3490
POC: Linden Hass

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: (Washington, D.C.) 301-792-8181

M10410 - Combination Heating/Cooling Systems

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service 301-984-2400

Blaw-Knox Corp/Hupp Co, Typhoon Air Conditioning Div 1135 Ivanhoe Rd
Cleveland, OH 44110 216-851-6200 Fax: 216-851-6274
POC: Joe Marino (x394)

Command-Aire Corp PO Box 7916 Waco, TX 76714-7916
817-840-3244 Fax: 817-840-2639
POC: Ellen Trick (Home Ofc.) / Jan Clark (Rep)
Rep: (Wash., D.C.) 301-984-2400

Hastings Industries Inc Hastings Industrial Pk E PO Box 548
Hastings, NE 68901-0548 402-463-9821
POC: Gary Brooks (Rep)
Rep: Brooks Co Bloomington, IL 309-452-2012

Heil-Quaker Corp/Tempstar Heating and Cooling Products
1136 Heil Quaker Blvd PO Box 3005 La Vergne, TN 37086-1985
615-793-0450 800-447-2882
POC: Claude Hayes

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Steve / Tony

Reed National Corp/Sterling Alton, Applied Air Div 4830 Transport Drive
Dallas, TX 75247 214-638-6010 Fax: 214-638-2395
POC: Scott Stallings / Buddy Cross

M105XX - Appliances**M10500 - Kitchen Appliances**

Maytag Company 1 Dependability Square Newton, IA 50208
515-792-7000 Fax: 515-791-8395
POC: Tom Weeks

Whirlpool Corporation - Consumer Services 2303 Pipestone Road
Benton Harbor, MI 49022 800-253-1301 Fax: 616-927-7829
POC: Timothy Costello

White Westinghouse International 10 Parkway Center Drive
Pittsburgh, PA 15220 412-928-8555 Fax: 412-928-0922
POC: Kurt Rogers

M10510 - Laundry Appliances

Maytag Company 1 Dependability Square Newton, IA 50208
515-792-7000 Fax: 515-791-8395
POC: Tom Weeks

Speed Queen Co. Shepard St. PO Box 990 Ripon, WI 54971-0990
414-748-3121
POC: Mike Besaw

Whirlpool Corporation - Consumer Services 2303 Pipestone Road
Benton Harbor, MI 49022 800-253-1301 Fax: 616-927-7829
POC: Donna Lynn

M10520 - Central Vacuum Cleaning

Central Vac International Incorporated 3133 East 12th Street
Los Angeles, CA 90023 213-268-1135 Fax: 213-268-9684
POC: George Crossman

Clarkson Industries Inc/Hoffman Air and Filtration Systems Div. PO Box 548
East Syracuse, NY 13057-0548 315-437-0311 800-258-8088
Fax: 315-432-8682
POC: Carl Wuerslin (Home Ofc.) / Ed Orndoff (Rep)
Rep: Neo Associates 717-359-9800

Sequoia Vacuum Systems Incorporated 164 Jefferson Drive
Menlo Park, CA 94025 415-322-7281 Fax: 415-322-8745
POC: Mike White

M106XX - Pumps**M10600 - General**

AMW Industries, Inc. 584 Commerce P.O. Box 1364 Conway, AR 72032
501-329-9811 Fax: 501-329-9812
POC: Sarah Moncada
Rep: (Wash., D.C.) Sam Desanto 301-881-8848

General Signal Corp/Aurora Pump 800 Airport Rd.
North Aurora, IL 60542 708-859-7000 Fax: 708-859-7000
POC: Shirley Fezekas (Home Ofc.) / David (Rep)
Rep: General Pump and Machine Peoria, IL 309-693-7444

Marley Pump Co/Red Jacket Pumps Div 5800 Fox Ridge Dr
Mission, KS 66202 913-831-5700 800-468-7867 Fax: 913-831-5145
POC: Kay Poirier

Peerless Pump 1200 Sycamore St. Montebello, Ca 90640
213-726-1232
POC: Tom Martin (Chicago Ofc - 708-298-2616)

Weil Pump Co 5921 W. Dickens Ave Chicago, IL 60639
312-637-8844 Fax: 312-637-5168
POC: David Leidy (x263)

M108XX - Fire Detection and Extinguishing Systems ** See E129XX **

M109XX - Heat Exchangers and Heat Recovery Packages

M10900 - Heat Exchangers

Amsted Industries Inc/Baltimore Aircoil Co Inc PO Box 7322
Baltimore, MD 21227 301-799-1300 Fax: 301-799-6416
POC: Roger Sauter (Rep)
Rep: A. Lombard and Co. (Illinois) 708-299-8010

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

Zero Corp/Mc Lean Midwest 4000 83rd Ave N
Brooklyn Park, MN 55443-2594 612-561-9400 800-284-2445
Fax: 612-569-0533
POC: Chip Lyon

M10910 - Heat Recovery Packages

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones

Hastings Industries Inc Hastings Industrial Pk E PO Box 548
Hastings, NE 68901-0548 402-463-9821
POC: Gary Brooks (Rep)
Rep: Brooks Co Bloomington, IL 309-452-2012

Rupp Industries Inc 11550 Rupp Dr Burnsville, MN 55337
612-894-3000 800-231-1882 Fax: 612-894-7877
POC: Terry Heer

M110XX - Humidifiers

M11000 - Humidifiers

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Carnes Co Inc 448 S Main St Verona, WI 53593
608-845-6411 Fax: 608-845-6470
POC: Jeff Lien (Home Ofc.) / Patty King (Rep)
Rep: S.E. Nelson Co Barke, VA 703-866-0200

Skuttle Manufacturing Co Route 10 Marietta, OH 45750
614-373-9169 800-848-9786 Fax: 614-373-9565
POC: Earl Lewis, Jr.

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
Carrier Pkwy PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

M111XX - Fans

M11100 - Exhaust Fans

Airmaster Fan Co 150 W North St PO Box 968 Jackson, MI 49204-0968
517-764-2300 800-255-3084 Fax: 517-787-3336
POC: Sales

American Coolair Corp 3604 Mayflower St PO Box 2300
Jacksonville, FL 32203 904-389-3646 Fax: 904-387-3449
POC: Neil Taylor (Home Ofc.) / Norm (Rep)
Rep: Lelund Enterprises Chicago, IL 708-430-4777

American Fan Co 2933 Symmes Rd Fairfield, OH 45014
513-874-2400 800-243-8160 Fax: 513-874-4096
POC: Mark Fitzgerald

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

Ampco-Pittsburgh Corp/Buffalo Forge Co 490 Broadway PO Box 985
Buffalo, NY 14240-0985 716-847-5121 Fax: 716-847-7435
POC: John Nelson (Rep)
Rep: Leonard G. Hey, Inc. Chicago, IL 708-520-4250

Cook Co 2015 E Dale St PO Box 4047 G S Springfield, MO 65808
417-869-6474
POC: Russ Mothersbaugh (Home Ofc.) / Wanda Spadaro (Rep)
Rep: Marus and Weimer, Inc. Chagrin Falls, OH 216-247-3570

King Co 1001 21st Ave NW PO Box 287 Owatonna, MN 55060
507-451-3770 Fax: 507-451-3786
POC: Linden Schewe (Home Ofc.) / Tom (Rep)
Rep: Gillespe and Associates Mt. Prospect, IL 708-398-1600

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
Carrier Pkwy PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

Western Blower Corp 18625 Railroad Ave City of Industry, CA 91748
818-964-6425
POC: George Dunn

M11110 - Centrifugal Fans

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

Ampco-Pittsburgh Corp/Buffalo Forge Co 490 Broadway PO Box 985
Buffalo, NY 14240-0985 716-847-5121 Fax: 716-847-7435
POC: John Nelson (Rep)
Rep: Leonard G. Hey, Inc. Chicago, IL 708-520-4250

Carnes Co Inc 448 S Main St Verona, WI 53593
608-845-6411 Fax: 608-845-6470
POC: Jeff Lien (Home Ofc.) / Patty King (Rep)
Rep: S.E. Nelson Co Burke, VA 703-866-0200

Cook Co 2015 E Dale St PO Box 4047 G S Springfield, MO 65808
417-869-6474
POC: Russ Mothersbaugh (Home Ofc.) / Wanda Spadaro (Rep)
Rep: Marus and Weimer, Inc. Chagrin Falls, OH 216-247-3570

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

Western Blower Corp 18625 Railroad Ave City of Industry, CA 91748
818-964-6425
POC: George Dunn

M11120 - Other Fans

American Coolair Corp 3604 Mayflower St PO Box 2300
Jacksonville, FL 32203 904-389-3646 Fax: 904-387-3449
POC: Neil Taylor (Home Ofc.) / Norm (Rep)
Rep: Lelund Enterprises Chicago, IL 708-430-4777
Rep2: S.E. Nelson Washington, D.C. 703-866-0200

American Fan Co 2933 Symmes Rd Fairfield, OH 45014
800-243-8160 Fax: 513-874-4096
POC: Mark Fitzgerald

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

M112XX - Heating Units

M11200 - Infra-Red Heating Units

Aitken Products Inc 566 N Eagle St PO Box 151 Geneva, OH 44041
216-466-5711 Fax: 216-466-5716
POC: Bob Bucklaew

Cox Manufacturing Co Inc 108 W. 2nd Ridgeville, IN 47380
317-857-2581 Fax: 317-857-2009
POC: Jim Garrisner

Gas-Fired Products Inc/Space-Ray Div 305 Doggett St PO Box 36485
Charlotte, NC 28236 704-372-3485 800-438-4936
Fax: 704-332-5843
POC: Liz Wooley

Infrared Dynamics 1040 W 17th St Costa Mesa, CA 92627
714-548-2245 714-548-2244
POC: Bob Cowan

Willow Manufacturing Inc/Lambert Industries Inc County Road 109
PO Box 17 Parkville, MN 55773 218-741-1510
Fax: 218-741-1513
POC: Steve Hinrichs

M11210 - Make-Up Air Units

Cambridge Engineering Inc 17825 Chesterfield Airport Rd PO Box 1010
Chesterfield, MO 63006 314-532-2233 Fax: 314-536-1342
POC: John Kramer

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Hastings Industries Inc Hastings Industrial Pk E PO Box 548
Hastings, NE 68901-0548 402-463-9821
POC: Gary Brooks (Rep) / Dave Cooper (Rep2)
Rep: Brooks Co Bloomington, IL 309-452-2012
Rep2: Victor Industrial Corp Warranton, VA 703-347-3008

King Co 1001 21st Ave NW PO Box 287 Owatonna, MN 55060
507-451-3770 Fax: 507-451-3786
POC: Linden Schewe (Home Ofc.) / Tom (Rep)
Rep: Gillespie and Associates Mt. Prospect, IL 708-398-1600

Reed National Corp/Sterling Alton, Applied Air Div 4830 Transport Dr
Dallas, TX 75247 214-638-6010 Fax: 214-638-2395
POC: Scott Stallings / Buddy Cross

Reed National Corp/Sterling Radiator Div 260 N Elm St
Westfield, MA 01085 413-568-9571 Fax: 413-568-9613
POC: Cliff Greaves (Rep)
Rep: Cliff Greaves Co Washington, D.C. 919-288-3588

Stamm International Group/Powrmatic Inc 2906 Baltimore Blvd
Finksburg, MD 21048 301-833-9100 800-966-9100
Fax: 800-966-7971
POC: Frank McGready / Melvin Anderson (Pres.)

M11220 - Space Heaters

Cambridge Engineering Inc 17825 Chesterfield Airport Rd PO Box 1010
Chesterfield, MO 63006 314-532-2233 Fax: 314-536-1342
POC: John Kramer

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Emerson Electric Co/Wiegand Div 641 Alpha Drive Pittsburgh, PA 15238
412-967-3900
POC: Gary Ozegovich (Rep)
Rep: Faber Renoff Washington, D.C. 301-768-4554

Stamm International Group/Powrmatic Inc 2906 Baltimore Blvd
Finksburg, MD 21048 301-833-9100 800-966-9100
Fax: 800-966-7971
POC: Frank McGready / Frank Anderson (Pres.)

M113XX - Air Conditioning

M11300 - ** Blank **

M11310 - Compressors

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Emerson Electric Co/Copeland Corp 1675 W Campbell Rd
Sidney, OH 45365-0669 513-498-3011
POC: Joe Lochtefeld

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
Carrier Pkwy PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

Vilter Manufacturing Corp 2217 S 1st St Milwaukee, Wi 53207
414-744-0111 Fax: 414-744-3483
POC: Gary Meszewski

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11320 - ** Blank **

M11330 - Computer Room, Air Conditioning

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Contempo Engineering Co 553 Constitution Ave Camarillo, CA 93010
805-484-7715 Fax: 805-987-4048
POC: Chuck Thompson

Data Aire Inc 7442 Orangewood Ave Garden Grove, CA 92641
714-891-3471 Fax: 714-896-0797
POC: Roland Geldert

Heat Exchangers Inc 8100 N Monticello Ave PO Box 790
Skokie, IL 60076-3325 708-679-0300 Fax: 708-679-2755
POC: Joe Pius

Tek Humitrol Inc PO Box 19839 Atlanta, GA 30325 404-355-8563
Fax: 404-452-0257
POC: John Peery / Bob Doonan

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

M11340 - Condensers, Air Conditioning

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

Amsted Industries Inc/Baltimore Aircoil Co Inc PO Box 7322
Baltimore, MD 21227 301-799-1300 Fax: 301-799-6416
POC: Roger Sauter (Rep)
Rep: A. Lombard and Co Chicago, IL 708-299-8010
Rep2: G.F. Marin Washington, D.C. 301-953-7770

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Ardco Inc/Russell Coil Co 221 S Berry St PO Box 1030
Brea, CA 92621-1030 714-529-1935 Fax: 714-529-7203
POC: Bob Wicker

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Emerson Electric Co/Copeland Corp 1675 W Campbell Rd
Sidney, OH 45365-0669 513-498-3011
POC: Joe Lochtefeld

Heil-Quaker Corp/Heil Heating and Cooling Products/Zone Aire
1136 Heil Quaker Blvd PO Box 3005 La Vergne, TN 37086-1985
615-793-0450 800-447-4700
POC: Claude Hayes

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Sales

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Roberts Associates Washington, D.C. 301-953-9036

Technical Systems Inc PO Box 309 Pryor, OK 74361
918-825-0720 Fax: 918-825-0723
POC: Gary Brooks (Rep)
Rep: Gary Brooks Co Bloomington, IL 309-452-2012

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

Vilter Manufacturing Corp 2217 S 1st St Milwaukee, Wi 53207
414-744-0111 Fax: 414-744-3483
POC: Gary Meszewski

Wickes Mfg Co, Bohn Heat Transfer Div 1625 E Voorhees St
Danville, Il 61832 217-446-3710
POC: Brian Zorns

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11350 - Controls, Air Conditioning

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11360 - Cooling Towers, Air Conditioning

Amsted Industries Inc/Baltimore Aircoil Co Inc PO Box 7322
Baltimore, MD 21227 301-799-1300 Fax: 301-799-6416
POC: Roger Sauter (Rep)
Rep: A. Lombard and Co Chicago, IL 708-299-8010
Rep2: G.F. Marin Co Washington, D.C. 301-953-7770

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Evapco Inc 3120 Frederick Ave Baltimore, MD 21229
301-945-3400 Fax: 301-945-2804
POC: Jim Payne

M11370 - Dehumidifiers, Air Conditioning

Dumont Industries Main St PO Box 148 Monmouth, ME 04259
207-933-4811 Fax: 207-933-2649
POC: Greg Wilson

MRI 4501 Pulaski Hwy Belcamp, MD 21017
301-575-7600
POC: Mike MacGuire

Tek Humitrol Inc PO Box 19839 Atlanta, GA 30325 404-482-6944
Fax: 404-452-0257
POC: John Peery / Bob Doonan

M11380 - Evaporators, Air Conditioning

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Evapco Inc 3120 Frederick Ave Baltimore, MD 21229
301-945-3400 Fax: 301-945-2804
POC: Jim Payne

Heil-Quaker Corp/Heil Heating and Cooling Products 1136 Heil Quaker Blvd
PO Box 3005 La Vergne, TN 37086-1985 615-793-0450 800-447-4700
POC: Claude Hayes

Lintern Corp 8685 Station St PO Box 90 Mentor, OH 44060
216-255-9333 800-321-3638 Fax: 216-255-6427
POC: Mike Considder

Reed National Corp/Sterling Alton, Applied Air Division 4830 Transport Dr
Dallas, TX 75247 214-638-6010
POC: Scott Stallings / Buddy Cross

Reed National Corp/Sterling Radiator Div 260 N Elm St
Westfield, MA 01085 413-568-9571 Fax: 413-568-9613
POC: Cliff Greaves (Rep)
Rep: Cliff Greaves Co Washington, D.C. 919-288-3588

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

Vilter Manufacturing Corp 2217 S 1st St Milwaukee, WI 53207
414-744-0111 Fax: 414-744-3483
POC: Gary Meszewski

M11390 - Fan Coil, Air Conditioning
American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington D.C. 301-984-2400

Ampco-Pittsburgh Corp/Buffalo Forge Co 490 Broadway PO Box 985
Buffalo, NY 14240-0985 716-847-5121 Fax: 716-847-7435
POC: John Nelson (Rep)
Rep: Leonard G. Hey Inc. Chicago, IL 708-520-4250

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Bard Manufacturing Co 1914 Randolph Dr PO Box 607 Bryan, OH 43506
419-636-1194 800-537-4595 Fax: 419-636-2640
POC: Wayne Patten

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Sales

North American Operations Carrier Corp Div, United Technologies
7310 W Morris St PO Box 70 Indianapolis, IN 46206
317-243-0851
POC: John Farrell

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M114XX - Air Conditioning Cont'd

M11400 - Heat Pumps, Air Conditioning

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Bard Manufacturing Co 1914 Randolph Dr PO Box 607 Bryan, OH 43506
419-636-1194 800-537-4595 Fax: 419-636-2640
POC: Wayne Patten

Command-Aire Corp PO Box 7916 Waco, TX 76714-7916
817-840-3244 Fax: 817-840-2639
POC: Ellen Trick (Home Ofc.) / Jan Clark (Rep) / Randy Hunzeker (Rep2)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400
Rep2: Trane Commercial Sales and Service Peoria, IL 309-691-4224

Harrow Co/FHP Manufacturing Div 601 NW 65th Court
Fort Lauderdale, FL 33309 305-776-5471 Fax: 305-776-5476
POC: Brad Grahil

Heat Exchangers Inc 8100 N Monticello Ave PO Box 790
Skokie, IL 60076-3325 708-679-0300 Fax: 708-679-2755
POC: Joe Pius

Heil-Quaker Corp/Heil Heating and Cooling Products 1136 Heil Quaker Blvd
PO Box 3005 La Vergne, TN 37086-1985 615-793-0450 800-447-4700
POC: Claude Hayes

Hydrotherm Inc Rockland Ave Northvale, NJ 07647
201-768-5500 Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Sales

North American Operations Carrier Corp Div, United Technologies
7310 W Morris St PO Box 70 Indianapolis, IN 46206
317-243-0851
POC: John Farrell (315-432-6000)

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

Whalen Co PO Box 1390 Easton, MD 21601
301-822-9200 Fax: 301-822-8926
POC: Bruce Whalen

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11410 - Roof Top Units, Air Conditioning
American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Command-Aire Corp PO Box 7916 Waco, TX 76714-7916
817-840-3244 Fax: 817-840-2639
POC: Ellen Trick (Home Ofc.) / Jan Clark (Rep) / Randy Hunzeker (Rep2)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400
Rep2: Trane Commercial Sales and Service Peoria, IL 309-691-4224

Donlee Technologies Inc/York-Shipley Div 693 North Hills Rd
York, PA 17402-2212 717-755-1081 Fax: 717-755-0020
POC: Bill Jones (x333)

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Harrow Co/F H P Manufacturing Division 601 NW 65th Court
Fort Lauderdale, FL 33309 305-776-5471 Fax: 305-776-5476
POC: Brad Grahm

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Sales

North American Operations Carrier Corp Div, United Technologies
7310 W Morris St PO Box 70 Indianapolis, IN 46206
317-243-0851
POC: John Farrell (315-432-6000)

Reed National Corp/Sterling Alton, Applied Air Division 4830 Transport Dr
Dallas, TX 75247 214-638-6010
POC: Scott Stallings / Buddy Cross

M11420 - Self-Contained Single Package, Air Conditioning

American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Ardco Inc/Russell Coil Co 221 S Berry St PO Box 1030
Brea, CA 92621-1030 714-529-1935 Fax: 714-529-7203
POC: Bob Wicker

Bard Manufacturing Co 1914 Randolph Dr PO Box 607 Bryan, OH 43506
419-636-1194 800-537-4595 Fax: 419-636-2640
POC: Wayne Patten

Blaw-Knox Corp/Hupp Co, Typhoon Air Conditioning Div 1135 Ivanhoe Rd
Cleveland, OH 44110 216-851-6200 Fax: 216-851-6274
POC: Joe Marino

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Heat Exchangers Inc 8100 N Monticello Ave PO Box 790
Skokie, IL 60076-3325 708-679-0300 Fax: 708-679-2755
POC: Joe Pius

Heil-Quaker Corp/Heil Heating and Cooling Products 1136 Heil Quaker Blvd
PO Box 3005 La Vergne, TN 37086-1985 615-793-0450 800-447-4700
POC: Claude Hayes

Lennox Industries Inc 2100 Lake Park Blvd Richardson, TX 75080
214-497-5000 Fax: 214-497-5299
POC: Sales

Lintern Corp 8685 Station St PO Box 90 Mentor, OH 44060
216-255-9333 800-321-3638 Fax: 216-255-6427
POC: Mike Considerer

North American Operations Carrier Corp Div, United Technologies
7310 W Morris St PO Box 70 Indianapolis, IN 46206
317-243-0851
POC: John Farrell (315-432-6000)

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

Vilter Manufacturing Corp 2217 S 1st St Milwaukee, WI 53207
414-744-0111 Fax: 414-744-3483
POC: Gary Meszewski

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

Zero Corp/Mc Lean Midwest 4000 83rd Ave N
Brooklyn Park, MN 55443-2594 612-561-9400 800-284-2445
Fax: 612-569-0533
POC: Chip Lyon

M11430 - Water Chillers, Air Conditioning
American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Contempo Engineering Co 553 Constitution Ave Camarillo, CA 93010
805-484-7715 Fax: 805-987-4048
POC: Clark Thompson

Data Aire Inc 7442 Orangewood Ave Garden Grove, CA 92641
714-891-3471 Fax: 714-896-0797
POC: Roland Geldert

Dunham-Bush Inc/Commercial Products Div 101 Burgess Rd
Harrisonburg, VA 22801 703-434-0711 Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep: Havtech Columbia, MD 301-621-8383

Heat Exchangers Inc 8100 N Monticello Ave PO Box 790
Skokie, IL 60076-3325 708-679-0300 Fax: 708-679-2755
POC: Joe Pius

Pomona Air Inc 1441 E 9th St Pomona, CA 91766
714-623-6908 Fax: 714-620-6087
POC: Dan Hobbs (Rep)
Rep: BTU Corp Oak Brook, IL 708-573-8731

Technical Systems Inc PO Box 309 Pryor, OK 74361
918-825-0720 Fax: 918-825-0723
POC: Gary Brooks (Rep)
Rep: Gary Brooks Co Bloomington, IL 309-452-2012

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11440 - Window Unit, Air Conditioning
Custom Controls Co PO Drawer 368 Bellaire, TX 77401
713-666-3258 800-231-3112
POC: Mark Deschner / Paul Ashcraft

Raytheon Co/Amana Refrigeration Inc, Heating and Cooling Products
(No Address) Amana, IA 52204 319-622-5511 800-843-0304
Fax: 319-622-2180
POC: Sales

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

M11450 - Air Cleaners, Air Conditioning
The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Bard Manufacturing Co 1914 Randolph Dr PO Box 607 Bryan, OH 43506
419-636-1194 800-537-4595 Fax: 419-636-2640
POC: Wayne Patten

Lintern Corp 8685 Station St PO Box 90 Mentor, OH 44060
216-255-9333 800-321-3638 Fax: 216-255-6427
POC: Mike Considder

Miller-Picking Corp PO Box 130 Johnstown, PA 15907
814-479-4023 Fax: 814-479-2469
POC: Dan Hobbs (Rep)
Rep: BTU Corp Oak Brook, IL 708-573-8731
Rep2: Kannapell-Rogers, Inc. Bethesda, MD 301-657-9171

North American Operations Carrier Corp Div, United Technologies
7310 W Morris St PO Box 70 Indianapolis, IN 46206
317-243-0851
POC: John Farrell (315-432-6000)

Snyder General Corp/American Air Filter PO Box 35690
Louisville, KY 40232-5690 502-637-0011 Fax: 502-637-0351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Roben Associates Washington, D.C. 301-953-9036

Stamm International Group/Powrmatic Inc 2906 Baltimore Blvd
Finksburg, MD 21048 301-833-9100 800-966-9100
Fax: 800-966-7971
POC: Frank McGready / Melvin Anderson (Pres.)

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

M11460 - Air Handling Units, Air Conditioning
American-Standard Inc/Trane Co 3600 Pammel Creek Rd
La Crosse, WI 54601-7599 608-787-2000
POC: Pat Bain (Rep)
Rep: Trane Commercial Sales and Service Washington, D.C. 301-984-2400

Ampco-Pittsburgh Corp/Buffalo Forge Co 490 Broadway PO Box 985
Buffalo, NY 14240-0985 716-847-5121 Fax: 716-847-7435
POC: John Nelson (Rep)
Rep: Leonard G. Hey, Inc. Chicago, IL 708-520-4250

The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Cook Co 2015 E Dale St PO Box 4047 G S Springfield, MO 65808
417-869-6474
POC: Ross Mothersbaugh (Home Ofc.) / Wanda Spadaro (Rep)
Rep: Marus and Weimer, Inc. Chagrin Falls, OH 216-247-3570

Hastings Industries Inc Hastings Industrial Pk E PO Box 548
Hastings, NE 68901-0548 402-463-9821
POC: Gary Brooks (Rep)
Rep: Brooks Co Bloomington, IL 309-452-2012
Rep2: Victor Industrial Corp Warranton, VA 703-347-3008

Miller-Picking Corp PO Box 130 Johnstown, PA 15907
814-479-4023 Fax: 814-479-2469
POC: Dan Hobbs (Rep)
Rep: BTU Corp Oak Brook, IL 708-573-8731
Rep2: Kannapell-Rogers, Inc Bethesda, MD 301-657-9171

Pomona Air Inc 1441 E 9th St Pomona, CA 91766
714-623-6908 Fax: 714-620-6087
POC: Dan Hobbs (Rep)
Rep: BTU Corp Oak Brook, IL 708-573-8731

Snyder General Corp 302 Nichols Dr Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep: John Robert Associates Washington, D.C. 301-953-9036

United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
PO Box 4808 Syracuse, NY 13221 315-432-6000
POC: John Farrell

York International Corp PO Box 1592 York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep: Paul Demeritte 301-792-8181

M11470 - Explosionproof Air Conditioning
The Applied Companies 13834 Del Sur St. San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

Custom Controls Co PO Drawer 368 Bellaire, TX 77401
713-666-3258 800-231-3112
POC: Mark Deschner / Paul Ashcraft

Matticks Industries, Inc. 5904 Jessamine, A-9 Houston, TX 77081
800-383-8151 Fax: 713-667-9802
POC: Kevin Matticks/Norman Matticks

Appendix C: Derating Factors

HVAC:

50Hz: The output of directly-coupled, motor-driven equipment must be derated to account for the reduction in shaft speed to 5/6 the 60Hz value. Otherwise, the mechanical coupling used between the motor and driven equipment should be purchased to give the required rotating speed. HVAC controls that are frequency dependent must be purchased in 50Hz configurations.

Voltage: Derating for voltage is not an option.

Electrical Distribution and Protection:**1) Transformers**

50Hz: In general, derating for frequency is not recommended. See Chapter 3 for details.
Voltage: Derating for voltage is not recommended.
Vendors can provide almost any needed input voltage rating.
Consult vendor regarding derating possibility if derating is absolutely necessary.

2) Power Factor Capacitors

50Hz: Derate KVAR rating by multiplying 60Hz KVAR rating by 5/6 to yield 50Hz KVAR rating.
Voltage: Derating for voltage is not recommended.
Vendors can provide almost any needed voltage rating.
Consult vendor regarding derating possibility if derating is absolutely necessary.

3) Protection Equipment

50Hz: Different trip curves may be needed.
Consult vendor for these curves.
Voltage: Derating for voltage should not be needed.
Verify with vendor since special protection equipment may need derating.

4) Other Electrical Distribution and Protection

Derating either cannot or should not be performed.
Contact vendors listed in Appendix C to purchase appropriately rated equipment.

Safety and Security Equipment:

50Hz: Depends on type of power supply.
Derating is either not necessary or not possible.
Contact vendor to purchase appropriately-configured power supply.
Voltage: Derating for voltage is not recommended.
Contact vendor to purchase appropriately-configured power supply, or
use transformer to convert supply voltage level to power supply input level.

Communication Equipment:

50Hz: Depends on type of power supply.
Derating is either not necessary or not possible.
Contact vendor to purchase appropriately-configured power supply.
Voltage: Derating for voltage is not recommended.
Contact vendor to purchase appropriately-configured power supply, or
use transformer to convert supply voltage level to power supply input level.

Lighting:**1) Incandescent**

- 50Hz: No derating necessary - Incandescents are frequency-insensitive.
Voltage: Not possible. Bulb life will suffer drastically.
Contact vendors listed in Appendix C to purchase high-voltage bulbs, or use transformer to convert supply voltage to lamp voltage.

2) Fluorescent and HID

- 50Hz: Derating is not recommended. Fixtures configured for 50Hz should be purchased.

Other Electrical Equipment:**1) Motors**

- 50Hz: In general, derating a 60Hz motor is not recommended. See Chapter 3 for exceptions.
Voltage: Derating for voltage is not recommended.
Contact vendors in Appendix C to purchase appropriately-configured equipment, or use transformer to convert supply voltage to motor's rated voltage level.

2) Motor Starters

- 50Hz: Derate by multiplying 60Hz horsepower rating by 4/5 to yield the 50Hz horsepower rating.
Voltage: Derating for voltage level is not possible.
Contact vendors in Appendix C to purchase appropriately-configured equipment, or use transformer to convert supply voltage to motor starter's rated voltage level.

3) Clocks

- 50Hz: Derating is possible but meaningless since 60Hz clock will not keep correct time in 50Hz environment.
Contact vendors in Appendix C to purchase 50Hz-rated clocks.
Voltage: Derating is not recommended.
Contact vendors in Appendix C to purchase appropriately-configured clocks, or use transformer to convert supply voltage to clock's rated voltage level.

4) Computer Power Supplies

- 50Hz: Derating is not possible due to equipment construction.
Contact vendors in Appendix C to purchase 50Hz-rated equipment.
Voltage: Derating is not possible.
Contact vendors in Appendix C to purchase appropriately-configured equipment, or use transformer to convert supply voltage to equipment's rated voltage level.

Appendix D: Numerical and Alphabetical Listing of Vendors and Manufacturers

- (1) A.B. Chance Co.
E11830
210 North Allen Street
Centralia, MO 65240-1395
314-682-5521
POC: Joe Johnson
- (2) A>B.B Power Transmission and Distribution
E11530, E11540
Highway 58 West
South Boston, VA 24592
804-575-2211
{POC: Dick Stoakley
- (3) A.S.C. Industries Inc./Power Distribution Group
E11100
8967 Pleasantwood Avenue N.W.
P.O. Box 2523
North Canton, OH 44720-0523
216-499-1210
Fax: 216-499-1213
POC: Mike Rice
- (4) AMW Industries, Inc.
M10600
584 Commerce
P.O. Box 1364
Conway, AR 72032
501-329-9811
Fax: 501-329-9812
POC: Sarah Moncada
Rep #1: (Wash., D.C.) Sam Desanto 301-881-8848
- (5) Acme Electric/Acme Transformer Division
E11500, E11510, E11520
4815 West 5th Street
Lumberton, NC 28358
919-738-1121
Fax: 919-739-0024
POC: Patti Grimmet
Rep #1: Electri Agency Inc. Elk Grove, IL 708/439-5030
- (6) Airmaster Fan Co
M11100
150 W North St
PO Box 968
Jackson, MI 49204-0968
517-764-2300 800-255-3084

Fax: 517-787-3336
POC: Sales

(7) Aitken Products Inc
M11200
566 N Eagle St
PO Box 151
Geneva, OH 44041
216-466-5711
Fax: 216-466-5716
POC: Bob Bucklaew

(8) Ajax Boiler Inc
M10220, M10230
17700 S. Main St
Gardena, CA 90248
213-321-2815
POC: Larry Miracle

(9) Aldrich Co
M10100, M10120, M10220, M10230
341 E Williams St
PO Box 97
Wyoming, IL 61491-0097
309-695-2311
Fax: 309-695-5779
POC: Ned Howard

(10) American Coolair Corp
M11100, M11120
3604 Mayflower St
PO Box 2300
Jacksonville, FL 32203
904-389-3646 Fax: 904-387-3449
POC: Neil Taylor (Home Ofc.) / Norm (Rep)
Rep #1: Lelund Enterprises Chicago, IL 708-430-4777

(11) American Fan Co
M11100, M11120
2933 Symmes Rd
Fairfield, OH 45014
513-874-2400 800-243-8160
Fax: 513-874-4096
POC: Mark Fitzgerald

(12) American-Standard Inc/Trane Co
M10400, M10410, M11100, M11110, M11310, M11340, M11350,
M11390, M11400, M11410, M11420, M11430, M11460
3600 Pammel Creek Rd
La Crosse, WI 54601-7599
608-787-2000

POC: Pat Bain (Rep)
Rep #1: Trane Commercial Sales and Service 301-984-2400

(13) Ampco-Pittsburgh Corp/Buffalo Forge Co
M11100, M11110, M11390, M11460
490 Broadway
PO Box 985
Buffalo, NY 14240-0985
716-847-5121 Fax: 716-847-7435
POC: John Nelson (Rep)
Rep #1: Leonard G. Hey, Inc. Chicago, IL 708-520-4250

(14) Amsted Industries Inc/Baltimore Aircoil Co Inc
M10900, M11340, M11360
PO Box 7322
Baltimore, MD 21227
301-799-1300
Fax: 301-799-6416
POC: Roger Sauter (Rep)
Rep #1: A. Lombard and Co. (Illinois) 708-299-8010

(15) Appleton Electric Co.
E10420, E10430, E10440, E10450, E10600,
E10610, E10620, E11000, E12100, E12110, E12120, E12130
1701 W. Wellington Ave.
Chicago, IL 60657
312-327-7200
Fax: 312-975-6349
POC: Terese McGary

(16) Arenco Inc/Russell Coil Co
M11340, M11420
221 S Berry St
PO Box 1030
Brea, CA 92621-1030
714-529-1935
Fax: 714-529-7203
POC: Bob Wicker

(17) Asco Controls/Automatic Switch Company
E11800, E11810
50-60 Hanover Road
Florham Park, NJ 07932
201-966-2000
Fax: 201-966-2628
POC: Henry Dacko
Rep #1: Automatic Switch Company Elk Grove, IL 708/640-3450

(18) Automatic Timing and Controls
E10480
959 Cheney Ave.
Marion, OH 43302
614-387-8827
Fax: 614-382-9080

POC: Ron Maul

(19) Bard Manufacturing Co
M11390, M11400, M11420, M11450
1914 Randolph Dr
PO Box 607
Bryan, OH 43506
419-636-1194 800-537-4595
Fax: 419-636-2640
POC: Wayne Patten

(20) Beckwith Electric Co. Inc.
E10460
P.O. Box 2999
Largo, FL 34649-2999
813-535-3408
Fax: 813-546-0121
POC: Jim Harlow

(21) Blaw-Knox Corp/Hupp Co, Typhoon Air Conditioning Div
M10410, M11420
1135 Ivanhoe Rd
Cleveland, OH 44110
216-851-6200
Fax: 216-851-6274
POC: Joe Marino (x394)

(22) Bogue Electric Manufacturing Co.
E11400, E11820
100 Pennsylvania Avenue
Paterson, NJ 07509
201-523-2200
Fax: 201-279-2973
POC: Joseph DeCeglia

(23) Boltswitch Inc.
E10430, E10440, E10450, E10470, E10480
6107 W. Lou Avenue
Crystal Lake, IL 60014
815-459-6900
Fax: 815-455-7788
POC: Dick Rahn

(24) Bridges Electric Inc.
E10430, E11830
Industrial Park Hwy. 110 East
P.O. Box 511
Heber, AR 72543
501-362-8296
Fax: 501-362-6970
POC: John Jones

(25) Bryan Steam Corp
M10000, M10200, M10230
PO Box 27
Peru, IN 46970
317-473-6651
Fax: 317-473-3074
POC: Bob Warren
Rep #1: Cummings-Wagner Annapolis, MD 301-490-9007

(26) Burle Industries Inc./Security Products
E12400, E12420
1000 New Holland Avenue
Lancaster, PA 17601-5688
717-295-6123
Fax: 717-295-6097
POC: Steve Neil

(27) Cambridge Engineering Inc
M11210, M11220
17825 Chesterfield
Airport Rd
PO Box 1010
Chesterfield, MO 63006
Fax: 314-536-1342
POC: John Kramer

(28) Carnes Co Inc
M11000, M11110
448 S Main St
Verona, WI 53593
608-845-6411
Fax: 608-845-6470
POC: Jeff Lien (Home Ofc.) / Patty King (Rep)
Rep #1: S.E. Nelson Co Barke, VA 703-866-0200

(29) Caterpillar Inc.
E11800, E11810, E11820
100 N.E. Adams Street
Peoria, IL 61629
309-675-1000
Fax: 309-675-6155
POC: Bob Kilper

(30) Central Vac International Incorporated
M10520
3133 East 12th Street
Los Angeles, CA 90023
213-268-1135
Fax: 213-268-9684
POC: George Crossman

(31) Challenger Electrical Equipment Corp.
E10430, E10440, E10450, E10470, E10600, E10610, E10620,
E10900, E11000, E11100, E11200, E11210, E11220, E11230,
E11500, E11510, E11520, E11530, E11840
508 Lapp Road
Malvern, PA 19355
215-647-5000
Fax: 215-640-0568
POC: Rose Harris
Rep #1: Challenger Electrical Elk Grove Village, IL 708-595-3840

(32) Chloride Systems/Lighting Alliance
E12000, E12010, E12020, E12030, E12040
4415 West Harrison Street
Suite 234
Hillside, IL 60162
708-449-8822
Fax: 708-449-8835
POC: Ed Vormann

(33) Cincinnati Fan Co.
M11120
7697 Snider Road
Mason, OH 45040
800-628-1200
POC: Donna Crews
Rep #1: R.R. Floody Inc. Rockford, IL 815-399-1931

(34) Clarkson Industries Inc/Hoffman Air and Filtration Systems Div.
M10520
PO Box 548
East Syracuse, NY 13057-0548
315-437-0311 800-258-8088
Fax: 315-432-8682
POC: Carl Wuerslin (Home Ofc.) / Ed Orndoff (Rep)
Rep #1: Neo Associates 717-359-9800

(35) Coates Heater Co Inc
M10000
18250 68th Ave S
Kent, WA 98032
206-872-7256
Fax: 206-251-0830
POC: Bob Wisenburg

(36) Columbia Boiler Co Of Pottstown
M10220, M10230
PO Box G
Pottstown, PA 19464
215-323-2700
POC: Barry Loar

(37) Comdial Corporation
E12740
1180 Seminole Trail
Charlottesville, VA 22906
800/347-1432
Fax: 804/978-2293
POC: Frank Feliciano

(38) Command-Aire Corp
M10410, M11400, M11410
PO Box 7916
Waco, TX 76714-7916
817-840-3244
Fax: 817-840-2639
POC: Ellen Trick (Home Ofc.) / Jan Clark (Rep)
Rep #1: (Wash.. D.C.) 301-984-2400

(39) Computer Power Inc.
E11700, E11710, E11720, E11730, E11740
124 West Main Street
High Bridge, NJ 08829
908-638-8000
Fax: 908-638-4931
POC: Tom Schreffler

(40) Contempo Engineering Co
M11330, M11430
553 Constitution Ave
Camarillo, CA 93010
805-484-7715
Fax: 805-987-4048
POC: Chuck Thompson

(41) Controlled Power Co.
E11710, E11720, E11730, E11740
1955 Stephenson Highway
Troy, MI 48083
313-528-3700
Fax: 313-528-0411
POC: Ed Reschka

- (42) Cook Co
M11100, M11110, M11460
2015 E Dale St
PO Box 4047 G S
Springfield, MO 65808
417-869-6474
POC: Russ Mothersbaugh (Home Ofc.) / Wanda Spadaro (Rep)
Rep #1: Marus and Weimer, Inc. Chagrin Falls, OH 216-247-3570
- (43) Cooper Industries Inc./Arrow-Hart Component Products Division
E10400, E10410
103 Hawthorn Street
Hartford, CT 06105
203-249-8471
POC: Kathy Krol
Rep #1: Eaton Corporation Milwaukee, WI 414-449-7780
- (44) Cooper Industries Inc./Crouse-Hinds Electrical Construction Materials
E10600, E10610, E10620, E11000, E11100, E12100, E12110,
E12120, E12130, E12410
Wolf and 7th North Streets
P.O. Box 4999
Syracuse, NY 13221
315-477-7000
Fax: 315-477-5717
POC: Carol Messinger
- (45) Cooper Industries/Cooper Power Systems/McGraw-Edison Power Systems
E10700, E10710, E11900
P.O. Box 2850
Pittsburgh, PA 15230
412-269-6700
Fax: 412-269-6761
POC: Gary Patterson
Rep #1: Vikeland Sales Inc. Addison, IL 708-832-8425
- (46) Coppus Engineering Corp/Kewanee Boiler Co Inc
M10210, M10220, M10230
101 Franklin St
Kewanee, IL 61443
309-853-3541
Fax: 309-852-3541
POC: Rod Young
Rep #1: Fairbanks and Associates Arlington, VA 703-931-1313
- (47) Corbett Lighting Inc.
E12100, E12120
2727 Northhaven Road
Dallas, TX 75229
214-241-8800
Fax: 214-241-4239
POC: Dave Meyer
Rep #1: Total Lighting Concepts Hillside, IL 708-449-2022

(48) Cornerstone Direct Corp./Ready Made Sign Co. Inc.
E12000, E12010, E12020, E12030, E12040
480 Fillmore Ave.
Tonawanda, NY 14151
716-695-7300
Fax: 800-222-1934
POC: Dan Howes

(49) Cortelco Inc./I.T.T. Telephones
E12740
Fulton Drive
Corinth, MS 38834
601/287-5281
Fax: 601/287-1473
POC: Mark Daniel

(50) Cox Manufacturing Co Inc
M11200
108 W. 2nd
Ridgeville, IN 47380
317-857-2581
Fax: 317-857-2009
POC: Jim Gartinger

(51) Cresswood Industrial Furnaces
E11820, M10210
4504-T Ellwalk Ave.
Cortland, IL 60112
800-962-7302 Ext. 71
POC: Larry Reiling

(52) Crown Industries Inc
M10220, M10230
3633 I St
Philadelphia, PA 19134
215-535-8900
Fax: 215-535-9736
POC: Paul Sohler

(53) Custom Controls Co
M11440, M11470
PO Drawer 368
Bellaire, TX 77401
713-666-3258 800-231-3112
POC: Mark Deschner / Paul Ashcraft

(54) Cyberex Inc.
E11800, E11810
7171 Industrial Park Blvd.
Mentor, OH 44060
216-946-1783
Fax: 216-946-5963
POC: Ed Meluch

(55) Data Aire Inc
M11330, M11430
7442 Orangewood Ave
Garden Grove, CA 92641
714-891-3471
Fax: 714-896-0797
POC: Roland Geldert

(56) Detection Systems Inc.
E12400, E12900, E12910
130 Perinton Parkway
Fairport, NY 14450
716-223-4060
Fax: 716-223-9180
POC: Jeff Matrachisia

(57) Donlee Technologies Inc/York-Shipley Div
M10220, M10230, M10400, M10910, M11210, M11220, M11410
693 North Hills Rd
York, PA 17402-2212
717-755-1081
Fax: 717-755-0020
POC: Bill Jones (x333)

(58) Dresser Rand Co./Steam Turbine, Motor and Generator Division
E11820
800 Central Avenue
Minneapolis, MN 55413-2403
612-378-8000
Fax: 612-378-8050
POC: Tim Spence

(59) Dual-Lite Inc.
E12000, E12010, E12020, E12030, E12040
Simm Lane
P.O. Box 468
Newtown, CT 06470
203-426-8011
Fax: 203-426-7486
POC: Patti Grimmel
Rep #1: Electri Agency Inc. Elk Grove, IL 708-439-5030

(60) Dumont Industries
M10000, M11370
Main St
PO Box 148
Monmouth, ME 04259
207-933-4811
Fax: 207-933-2649
POC: Greg Wilson

- (61) Dunham-Bush Inc/Commercial Products Div
M10220, M10230, M10900, M11340, M11390, M11410, M11420, M11430
101 Burgess Rd
Harrisonburg, VA 22801
703-434-0711
Fax: 703-434-4010
POC: Jim McLarty (Rep)
Rep #1: Havtech Columbia, MD 301-621-8383
- (62) Durham Company
E10900, E11230
P.O. Box 908
Lebanon, MO 65536
417-532-7121
Fax: 417-532-2366
POC: John Chastain
- (63) ESSEF Industries Inc/Pac-Fab Inc
M10020
1620 Hawkins Ave
Sanford, NC 27330
919-774-4151 800-833-3692
Fax: 919-774-4841
POC: Doug Stout
- (64) Eagle Electric Manufacturing Co. Inc.
E10400, E10410, E10440, E10450, E10700, E10710
45-31 Court Square
Long Island City, NY 11101
718-937-8000
Fax: 718-482-0160
POC: Harlan Berman
- (65) Electric Heater Co.
M10000
45 Seymour St
PO Box 288
Stratford, CT 06497-0288
203-378-2659
Fax: 203-378-3593
POC: Bill Newbauer, Jr.
- (66) Electric Time Co. Inc.
E12300
45 West Street
Medfield, MA 02052
508-359-4396
Fax: 508-359-4482
POC: Tom Erb

- (67) Emerson Electric Co/Copeland Corp
M11310, M11340
1675 W Campbell Rd
Sidney, OH 45365-0669
513-498-3011
POC: Joe Lochtefeld
- (68) Emerson Electric Co/Wiegand Div
M10300, M11220
641 Alpha Drive
Pittsburgh, PA 15238
412-967-3900
POC: Gary Ozegovich (Rep)
Rep #1: Faber-Renoff Baltimore, MD 301-768-4554
- (69) Evapco Inc
M11360, M11380
3120 Frederick Ave
Baltimore, MD 21229
301-945-3400
Fax: 301-945-2804
POC: Jim Payne
- (70) Fire-Lite Alarms Inc.
E12900, E12910
12 Clintonville Road
Northford, CT 06472
203/484-7161
Fax: 203/484-7118
POC: Ray Weymann
- (71) Gas-Fired Products Inc/Space-Ray Div
M11200
305 Doggett St
PO Box 36485
Charlotte, NC 28236
704-372-3485 800-438-4936
Fax: 704-332-5843
POC: Liz Wooley
- (72) General Electric Co./Industry Sales and Services Division
E11840, E11900
1 River Road
Schenectady, NY 12345
518-385-2211
POC: Warren Molitor
Rep #1: General Electric Co., Bloomington, IL 309-664-1474

(73) General Electric Company
E10900, E11000, E11100, E11200, E11210, E11220, E11230, E11300,
E11310, E11320, E11500, E11510, E11520
41 Woodford Avenue
Plainville, CT 06062
POC: Warren Molitor
Rep #1: General Electric Co. Bloomington, IL 309-664-1474

(74) General Signal Corp/Aurora Pump
M10600
800 Airport Rd.
North Aurora, IL 60542
708-859-7000
Fax: 708-859-7000
POC: Shirley Fezekas (Home Ofc.) / David (Rep)
Rep #1: General Pump and Machine Peoria, IL 309-693-7444

(75) General Signal Corporation/Sola Division
E11700
1717 Busse Road
Elk Grove Village, IL 60007
708-439-2800
Fax: 708/439-1160
POC: Tom McCaughn

(76) Genlyte Group Inc/Imperial Bronzelite
M10010
500 Wonder World Dr
PO Box 606
San Marcos, TX 78666
512-392-5821 512-392-8957
Fax: 512-353-5822
POC: Clark Douglas

(77) HB Instrument Co.
E10460
104 W. Seventh Ave
Trappe, PA 19426-0770
215-489-5504
Fax: 800-HB1-FAX2
POC: Ed Hergesel

(78) Harrow Co/FHP Manufacturing Division
M11400, M11410
601 NW 65th Court
Fort Lauderdale, FL 33309
305-776-5471
Fax: 305-776-5476
POC: Brad Grahm

(80) Hastings Industries Inc
M10300, M10410, M10910, M11210, M11460
Hastings Industrial Pk E
PO Box 548
Hastings, NE 68901-0548
402-463-9821
POC: Gary Brooks (Rep)
Rep #1: Brooks Co Bloomington, IL 309-452-2012

(81) Heat Exchangers Inc
M11330, M11400, M11420, M11430
8100 N Monticello Ave
PO Box 790
Skokie, IL 60076-3325
708-679-0300
Fax: 708-679-2755
POC: Joe Pius

(82) Heil-Quaker Corp/Heil Heating and Cooling Products
M11380, M11400, M11420
1136 Heil Quaker Blvd
PO Box 3005
La Vergne, TN 37086-1985
615-793-0450 800-447-4700
POC: Claude Hayes

(83) Heil-Quaker Corp/Heil Heating and Cooling Products/Zone Aire
M11340
1136 Heil Quaker Blvd
PO Box 3005
La Vergne, TN 37086-1985
615-793-0450 800-447-4700
POC: Claude Hayes

(84) Heil-Quaker Corp/Tempstar Heating and Cooling Products
M10410
1136 Heil Quaker Blvd
PO Box 3005
La Vergne, TN 37086-1985
615-793-0450 800-447-2882
POC: Claude Hayes

(85) Hydrotherm Inc
E10420, M10220, M10230, M11340, M11350, M11400
Rockland Ave
Northvale, NJ 07647
201-768-5500
Fax: 201-768-3464
POC: Floyd Lewis / Joe Beshar (V.P.)

(86) Industrial Boiler Company Inc.
M10210
P.O. Drawer 2258
Thomasville, GA 31792
Fax: 912-226-3027
POC: Mark Nesmith

(87) Infrared Dynamics
M11200
1040 W 17th St
Costa Mesa, CA 92627
714-548-2245 714-548-2244
POC: Bob Cowan

(88) International Configurations Inc.
E13000, E13010
P.O. Box 3374
Enfield, CT 06082
203-749-6380
Fax: 203-749-2985
POC: Harold Mitchell

(89) Janco Corporation
E10420
3111-T Winona Avenue
Burbank, CA 91504
818-846-1800
Fax: 818-842-3396
POC: Paul Gerritse

(90) King Co
M11100, M11210
1001 21st Ave NW
PO Box 287
Owatonna, MN 55060
507-451-3770
Fax: 507-451-3786
POC: Linden Schewe (Home Ofc.) / Tom (Rep)
Rep #1: Gillespe and Associates Mt. Prospect, IL 708-398-1600

(91) Lapp Insulator Co./Power Structures Inc.
E11830
P.O. Box 6261
New Orleans, LA 70174
504-394-7433
Fax: 504-391-9692
POC: Pat Deloney

(92) Lennox Industries Inc
M10400, M10410, M11340, M11390, M11400, M11410, M11420
2100 Lake Park Blvd
Richardson, TX 75080
214-497-5000
Fax: 214-497-5299
POC: Steve / Tony

(93) Lindsey Manufacturing Co.
E11830
760 North Georgia Avenue
Azusa, CA 91702
818-969-3471
Fax: 818-969-3177
POC: Jiji Smith

(94) Lintern Corp
E11830, M11380, M11420, M11450
8685 Station St
PO Box 90
Mentor, OH 44060
216-255-9333 800-321-3638
Fax: 216-255-6427
POC: Mike Considder

(95) Little Giant Manufacturing Co Inc
M10000
907 7th St
PO Box 518
Orange, TX 77630
409-883-4246 800-231-6035
POC: Alan McCorquodale

(96) Lochinvar Corp
M10000, M10100, M10110, M10120, M10200, M10230
2005 Elm Hill Park
Nashville, TN 37210
615-889-8900
Fax: 615-885-4403
POC: Scott Armstrong

(97) Lumark Lighting/Cooper Lighting
E12110, E12130
400 Busse Road
Elk Grove Village, IL 60007
312-956-8400
Fax: 312-956-1537
POC: James Byrket
Rep #1: Westinghouse Supply Co. Danville, IL 217-442-1901

(98) MRI

M11370
4501 Pulaski Hwy
Belcamp, MD 21017
301-575-7600
POC: Mike MacGuire

(99) Marathon Electric

E10420, E11400
100 E. Randolph St.
Wausau, WI 54401
715-675-3311
Fax: 715-675-6361
POC: Shelley Thompson

(100) Marley Co/Weil-Mc Lain

M10200, M10220, M10230
Blaine St
Michigan City, IN 46360
219-879-6561
POC: Jim Wells / Jim Platt

(101) Marley Pump Co/Red Jacket Pumps Div

M10600
5800 Fox Ridge Dr
Mission, KS 66202
913-831-5700 800-468-7867
Fax: 913-831-5145
POC: Kay Poirier

(102) Matticks Industries, Inc.

M11470
5904 Jessamine, A-9
Houston, TX 77081
800-383-8151
Fax: 713-667-9802
POC: Kevin Matticks/Norman Matticks

(103) Maytag Company

M10500, M10510
1 Dependability Square
Newton, IA 50208
515-792-7000
Fax: 515-791-8395
POC: Tom Weeks

(104) Micro Switch/Honeywell Division
E10420
11 West Spring Street
Freeport, IL 61032
815-235-6600
Fax: 815-235-6545
POC: Dave Hill

(105) Miller-Picking Corp
M11450, M11460
PO Box 130
Johnstown, PA 15907
814-479-4023
Fax: 814-479-2469
POC: Dan Hobbs (Rep)
Rep #1: BTU Corp Oak Brook, IL 708-573-8731
Rep #2: Kannapell-Rogers, Inc. Bethesda, MD 301-657-9171

(106) Monaco Enterprises Inc.
E12400, E12410, E12900
East 14820 Sprague Avenue
Spokane, WA 99214-0129
509-926-6277
Fax: 509-924-4980
POC: Dan Long

(107) Mor-Flo Industries Inc/American Appliance Manufacturing Corp
M10100, M10110
PO Box 1956
Santa Monica, CA 90406
213-829-1755
Fax: 213-828-1940
POC: Jim Yerman

(108) Motorola Inc.
E12740
1475 West Shure Drive
Arlington Heights, IL 60004
708-632-5000
Fax: 708-632-6034
POC: Marge Seda

(109) Niagra Transformer Corp.
E11530, E11540
1751 Dale Road
Buffalo, NY 14225
716-896-6500
Fax: 716-896-8871
POC: Bill Hanavan

(110) North American Operations Carrier Corp Div, United Technologies
M11390, M11400, M11410, M11420, M11450
7310 W Morris St
PO Box 70
Indianapolis, IN 46206
317-243-0851
POC: John Farrell

(111) Nu Tone Inc.
E12300, E12410, E12420, E12710, E12720
Madison and Red Bank Roads
Cincinnati, OH 45227
513-527-5100
POC: Mike Walsh

(112) Paddock Pool Equipment Co Inc
M10010, M10020
555 Paddock Pkwy
PO Box 11676
Rock Hill, SC 29730
803-324-1111
Fax: 803-324-1116
POC: Eddie Graves

(113) Panel Components Corp.
E13000, E13010
P.O. Drawer 6626
Santa Rosa, CA 95406
707-534-0600
Fax: 707-578-5478
POC: Kim Eades

(114) Parker Boiler Co
M10230
5930 Bandini Blvd
Los Angeles, CA 90040-2999
213-727-9800
Fax: 213-722-2848
POC: Martin Bender / Greg Danenhauer

(115) Paso Sound Products Inc.
E12700, E12710, E12720, E12730
14 First Street
Pelham, NY 10803-1495
914-738-4800
Fax: 914-738-3954
POC: Ken O'Brien

(116) Pass and Seymour/Legrand
E1300, E13010
344 Carol Lane
Elmhurst, IL 60126
708-832-2500
Fax: 708-323-2524
POC: Jim Knapi

(117) Peerless Pump
M10600
1200 Sycamore St.
Montebello, Ca 90640
213-726-1232
POC: Tom Martin (Chicago Ofc - 708-298-2616)

(118) Pittway Corporation/Ademco Division
E12400, E12410, E12900, E12910
180 Michael Drive
Syosset, NY 11791
516-921-6700
Fax: 516-921-6700
POC: Tony Franco

(119) Pittway Corporation/Notifier Division
E12900, E12910
12 Clintonville Road
Northford, CT 06472
800-289-3473
Fax: 203-484-7118
POC: Ray Weymann

(120) Pomona Air Inc
M11430, M11460
1441 E 9th St
Pomona, CA 91766
714-623-6908
Fax: 714-620-6087
POC: Dan Hobbs (Rep)
Rep #1: BTU Corp Oak Brook, IL 708-573-8731

(121) Precision Parts Corp
M10200, M10230
4340 E Main St
PO Box 2159
Morristown, TN 37814
615-587-9390
Fax: 615-581-7749
POC: Mark Cole

(122) Prescolite/U.S.I. Lighting
E12100, E12110, E12120, E12130
1251 Doolittle Drive
San Leandro, CA 94577
415-562-3500
POC: Mark Benguerel

(123) Racon Incorporated
E12400
12628 Interurban Avenue South
Seattle, WA 98168
206-241-1110
Fax: 206-246-9306
POC: Tim Tewey

(124) Rapid Power Technologies Inc.
E11710, E11720, E11730, E11740
Graysbridge Road
Brookfield, CT 06804
203-775-0411
Fax: 203-775-0666
POC: Fred Eigenrauch

(125) Rauland-Borg Corp.
E12700, E12710, E12720, E12730
3450 West Oakton Street
Skokie, IL 60076-2951
708-679-0900
Fax: 708-679-0625
POC: Bill Martin
Rep #1: Life Safety Design Danville, IL 217/446-2564

(126) Raytheon Co/Amana Refrigeration Inc, Heating and Cooling Products
M11440
(No Address)
Amana, IA 52204
319-622-5511 800-843-0304
Fax: 319-622-2180
POC: Sales

(127) Reed National Corp/Sterling Alton, Applied Air Div
M10400, M10410, M11210
4830 Transport Dr
Dallas, TX 75247
214-638-6010 Fax: 214-638-2395
POC: Scott Stallings / Buddy Cross

(128) Reed National Corp/Sterling Alton, Applied Air Division
M11210
4830 Transport Dr
Dallas, TX 75247
214-638-6010
POC: Scott Stallings / Buddy Cross

(129) Reed National Corp/Sterling Radiator Div
M10300, M10400, M11210, M11380
260 N Elm St
Westfield, MA 01085
413-568-9571
Fax: 413-568-9613
POC: Cliff Greaves (Rep)
Rep #1: Cliff Greaves Co Washington, D.C. 919-288-3588

(130) Reliance Electric Co.
E11400
24701 Euclid Ave.
Cleveland, OH 44117
216-266-7000
POC: Jim Bowers

(131) Reliance Electric Co./Kato Engineering Co.
E1170
2075 Howard Drive
Mankato, MN 56001
507-625-4011
Fax: 507-345-2798
POC: Larry Sieberg

(132) Rheem Manufacturing Co/Ruud Water Heater Div
M10100, M10110
5780 Peachtree-Dunwoody Road NE
Atlanta, GA 30342
205-260-1500 800-432-8373
POC: Russel Maddox / Roger Clark

(133) Rupp Industries Inc
M10910
11550 Rupp Dr
Burnsville, MN 55337
612-894-3000 800-231-1882
Fax: 612-894-7877
POC: Terry Heer

(134) S and C Electric Co.
E10700, E10710
6601 North Ridge Boulevard
Chicago, IL 60626
312-338-1000
POC: Bob Tucker
Rep #1: S and C Electric Co. St. Louis, MO 314/997-6440

(135) Sequoia Vacuum Systems Incorporated
M10520
164 Jefferson Drive
Menlo Park, CA 94025
415-322-7281
Fax: 415-322-8745
POC: Mike White

(136) Siebring Manufacturing Inc/Siebring Battery Div
M10400
PO Box 658
George, IA 51237
712-475-3317 Fax: 712-475-3490
POC: Linden Hass

(137) Simplex Time Recorder Co.
E12300
Simplex Plaza
Gardner, MA 01441-0001
508-632-2500
POC: Dave Ringland
Rep #1: Simplex Time Recorder Co. East Peoria, IL 309/694-8000

(138) Skuttle Manufacturing Co
M11000
Route 10
Marietta, OH 45750
614-373-9169 800-848-9786
Fax: 614-373-9565
POC: Earl Lewis, Jr.

(139) Smith Corp/Smith Water Products Co
M10000, M10100, M10110, M10120, M10230
5605 Mac Arthur Blvd Suite 360
Irving, TX 75038
214-518-1990 800-527-1953
Fax: 214-518-1736
POC: Paul Woodward

(140) Snyder General Corp
M11340, M11380, M11400, M11420, M11460
302 Nichols Dr
Hutchins, TX 75141
214-225-7351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep #1: John Robert Associates Washington, D.C. 301-953-9036

(141) Snyder General Corp/American Air Filter
M11450
PO Box 35690
Louisville, KY 40232-5690
502-637-0011
Fax: 502-637-0351
POC: Rich Huber (Rep) / Tom Donovan (Rep)
Rep #1: John Robert Associates Washington, D.C. 301-953-9036

(142) Speed Queen Co.
M10510
Shepard St.
PO Box 990
Ripon, WI 54971-0990
414-748-3121
POC: Mike Besaw

(143) Square D Co./Consumer Products Division
E10400, E10420, E10450, E10480, E10710, E11100, E11200, E11210,
E11220, E11230, E11300, E11310, E11320, E11500, E11510
1870 Roselle Road
Hillcrest Commons
Schaumburg, IL 60195
708-397-9559
Fax: 708-397-8814
POC: Doug Atkinson
Rep #1: Square D Company Champaign, IL 217/356-0211

(144) Square D Co./Distribution Equipment Division
E11840
1601 Mercer Road
Lexington, KY 40511
606-254-6412
POC: Doug Atkinson
Rep #1: Square D Company Champaign, IL 217/356-0211

(145) Stamm International Group/Powrmatic Inc
M10300, M11210, M11450
2906 Baltimore Blvd
Finksburg, MD 21048
301-833-9100 800-966-9100
Fax: 800-966-7971
POC: Frank McGready / Melvin Anderson (Pres.)

(146) State Industries Inc
M10100, M10110
500 By-Pass Rd
Ashland City, TN 37015
615-792-4371 800-365-0024
Fax: 800-365-FAX2
POC: Ben Major

(147) Technical Systems Inc
M11340, M11430
PO Box 309
Pryor, OK 74361
918-825-0720
Fax: 918-825-0723
POC: Gary Brooks (Rep)
Rep #1: Gary Brooks Co Bloomington, IL 309-452-2012

(148) Tek Humitrol Inc
M11330, M11370
PO Box 19839
Atlanta, GA 30325
404-355-8563
Fax: 404-452-0257
POC: John Peery / Bob Doonan

(149) The Applied Companies
M11000, M11310, M11330, M11340, M11350, M11360, M11380, M11390,
M11400, M11410, M11420, M11430, M11450, M11460, M11470
13834 Del Sur St.
San Fernando, CA 91340
818-896-7443
POC: Ron Winkler

(150) Three M Co.(3M)/Sound Products
E12700, E12710, E12720, E12730
3M Center Building 551-1W-01
St. Paul, MN 55144-1000
612-733-9214
Fax: 612-736-7614
POC: Paul Nitschke

(151) United Technologies Corp/Building Group/Carrier Corp/Carrier Air Conditioning
M11310, M11340, M11390, M11400, M11420, M11430, M11440, M11450, M11460
Carrier Pkwy
PO Box 4808
Syracuse, NY 13221
315-432-6000
POC: John Farrell

(152) Valmont Electric Inc.
E10410
1430 East Fairchild Street
Danville, IL 61832
217-446-4600
Fax: 217-431-5740
POC: Knox Wilkie

(153) Vilter Manufacturing Corp
M11310, M11340, M11380, M11420
2217 S 1st St
Milwaukee, Wi 53207
414-744-0111
Fax: 414-744-3483
POC: Gary Meszewski

(154) W M Hobbs, LTD
M10010, M10020
3786 Northeast Expressway
Atlanta, GA 30340
404-457-3000
POC: Roger Graham

(155) Weben-Jarco Inc
M10100
4007 Platinum Way
PO Box 763460
Dallas, TX 75376-3460
214-637-0530 800-527-6449
Fax: 214-330-6864
POC: Doug Kinser
Rep #1: (Wash., D.C.) Steck Sales 301-948-7502

(156) Weil Pump Co
M10600
5921 W. Dickens Ave
Chicago, Il 60639
312-637-8844
Fax: 312-637-5168
POC: David Leidy (x263)

(157) Wells Fargo Security Products
E12420
1010 North Glebe Road
Arlington, VA 22201
703-247-4250
POC: Dallas Steele

(158) Western Blower Corp
M11100, M11110
18625 Railroad Ave
City of Industry, CA 91748
818-964-6425
POC: George Dunn

(159) Westinghouse Electric Supply Co.
E10460, E10470, E10480, E10600, E10610, E10620, E10900, E11000,
E11100, E11200, E11210, E11220, E11230, E11300, E11310, E11320,
E11400, E11500, E11510, E11520, E11530, E11540, E11840, E11900
603 North Gilbert Street
Danville, IL 61832
217-442-1901
Fax: 217-442-7317
POC: Butch Fettters

(160) Whalen Co
M11400
PO Box 1390
Easton, MD 21601
301-822-9200
Fax: 301-822-8926
POC: Bruce Whalen

(161) White Westinghouse International
M10500
10 Parkway Center Drive
Pittsburgh, PA 15220
412-928-8555
Fax: 412-928-0922
POC: Kurt Rogers

(162) Wickes Mfg Co. Bohn Heat Transfer Div
M11340
1625 E Voorhees St
Danville, Il 61832
217-446-3710
POC: Brian Zorns

(163) Willow Manufacturing Inc/Lambert Industries Inc
M11200
County Road 109
PO Box 17
Parkville, MN 55773
218-741-1510
Fax: 218-741-1513
POC: Steve Hinrichs

(164) York International Corp
M10400, M11310, M11340, M11350, M11390, M11400, M11420,
M11430, M11460
PO Box 1592
York, PA 17405-1592
717-771-7890
POC: Paul Demeritte (Rep)
Rep #1: (Washington, D.C.) 301-792-8181

(165) Zero Corp/Mc Lean Midwest
M10900, M11420
4000 83rd Ave N
Brooklyn Park, MN 55443-2594
612-561-9400 800-284-2445
Fax: 612-569-0533
POC: Chip Lyon

(166) Whirlpool Corporation Consumer Services
M10500, M10510
2303 Pipestone Road
Benton Harbor, MI 49022
800-253-1301
Fax: 616-927-7829
POC: Timothy Costello

Appendix E: Equipment/Vendor Tables

This Appendix contains tables that graphically represent different types of equipment, their attributes, and the American vendors that supply the equipment. the following page gives a legend that explains how the data are represented in the tables.

"50 Hz Vendor Selection Tables" Explanation Chart

All 3 of these vendors produce the class of component labelled "Explosion Proof Switches."

For instance, Appleton carries explosion proof switches rated to handle between 20 to 200 amps at up to 600 volts, for 1,2, or 3 poles.

Can the same component handle 50 and 60 Hz?

Is the component sensitive to different frequencies?

How many phases can it handle?

These are the voltage ratings.

Is 50 Hz operation possible at all?

Is the component derated for 50 Hz operation, and if so, how?

Class:	Ratings:	100 200V	110 220V	120 240V	127 220V	220 380V	230 400V	240 415V	277 480V	# of Phases Avail?	50/60Hz Sens?	50Hz Avail?	Derating Method:	% USA Mkt:	% USA Owned:	UL Listed?	Vendors:	Comments:	Additional Vendors:
i-10420 - Explosion Proof Switches	20 - 200A, 1-3 Pole, in 600V to 15A	Yes	1 & 3	Yes	No	No	100	100	Yes	#14 - Appleton Electric	#85								
	to 225A, 3 Pole	Yes	1 & 3	Yes	No	Yes	100	100	Yes	#99 - Micro Switch / Honeywell									
		Yes	3	Yes	No	Yes	95	100	Yes	#135 - Square D Products									

This highlighted information is for this corresponding highlighted vendor.

SOL Iz Vendor Selection Tables

Class:	Ratings:	100	110	120	120	127	220	230	240	277	# of 50Hz	50Hz	De-	4, USA	%USA	UH,	Vendors:	Comments:
E10400 - Tongue Switches	1- 60A 1,3,5,6,10,15,20,30A 20A to 600V, 30A to 250V	Yes	Yes	Yes	Yes	No	No	No	1	Yes	No	No	No	N/A	100	100	Yes	\$53 - Cooper Industries Inc/Arrow Hart
E10410 - Dimmer Switches	600,1000,1500,2000W Inrand & Fluor	Yes	No	1	Yes	No	Yes	No	100	100	Yes	#64 - Eagle Electric						
E10410 - Explosion Proof Switches	600,1000,1500,2000W Inrand & Fluor 10-200A, 1-3 Pole, 10-600V to 15A to 250A, 3 Pole	Yes	No	1	Yes	No	Yes	No	100	100	Yes	\$53 - Cooper Industries Inc/Arrow Hart						
E10410 - Disconnect Switches	10- 200A, 3 Pole, 10-600V up to 200A	Yes	No	1 & 3	Yes	No	Yes	No	100	100	Yes	#143 - Square D Products						
E10440 - Control Switches	600V max, Up to 6000A	Yes	1 & 3	Yes	No	Yes	No	100	100	Yes	Additional Vendors: #87							
E10450 - Contactors	10A, 600V Max	Yes	1	Yes	No	Yes	No	100	100	Yes	#15 - Appleton Electric							
E10450 - Contactors	20A @250V, 30A @ 600V max Up to 200A	Yes	1 & 3	Yes	No	Yes	No	100	100	Yes	#31 - Challenger Electrical Equipment							
E10460 - Relays	5-240A, 0.33 - 250HP	Yes	(8)	Yes	(8)	Yes	No	100	100	Yes	#23 - Busselitch							
E10470 - Safety Switches	10- 150A 2-12 Pole to 600V AC coil, to 60A 30 - 600A, fused & unfused 600V max, 400,600,800,1200A 600V max, 30-1200A, 2-Wire	No	No	No	No	Yes	Yes	Yes	Yes	(8)	Yes	(8)	Yes	No	100	100	Yes	#11 - Beckwith Electric Co.
E10480 - Time Switches	1-10A, interval Timers Up to 600V, Up to 10A 40A, 24hr, 7 day, or astro. dial	Yes	Yes	Yes	Yes	No	100	100	Yes	#77 - HB Instrument Co.								
E10600 - Motor Starters (Unfused)	5 - 200HP @ 600V (Nema 0-5) Up to 100HP	Yes	1 & 3	No	Yes	Yes	No	100	100	Yes	#161 - Westinghouse							
E10610 - Motor Starters (Fused)	5- 200HP @ 600V (Nema 0-5) Up to 100HP	Yes	1 & 3	No	Yes	Yes	No	100	100	Yes	#11 - Beckwith Electric							
E10620 - Motor Starters (W/Ckt Brkr)	5 - 200HP @ 600V (Nema 0-5) Up to 100HP @ 600V (Nema 0-5) 3-200HP @ 600V (Nema 0-5)	Yes	1 & 3	No	Yes	Yes	No	100	100	Yes	#11 - Beckwith Electric							
E10700 - Fuses	1-200A Class H,K,R,B,K 1-600A 1-600A, Up to 600V Max,R41	Yes	1	Yes	Yes	Yes	No	100	100	Yes	#161 - Cooper Industries / Crouse-Hinds							
E10710 - Fuse Cabinets	To 600V, 200A max. To 600V To 600V	Yes	3&4W	Yes	Yes	Yes	No	100	100	Yes	#143 - Square D Products							

- (6) Only ExplosionProof
- (7) ASME Section 4
- (8) 60Hz Only
- (10) Different Components Used
- (11) Slower Read Speed
- (12) By Request

2) Performance Rating
3) ETL & IUL Listed

On This Page:
Siemens Motor Starters Fuses & Fuse Cabinets

50Hz Vendor Selection Tables

Class:	Ratings:	100	110	120	127	220	240	277	# of Solen/Phases	Avail/	Soln/Phas/ Avail?	50Hz/ Solen?	De- ratating	46, USA Owned	'USA Owned?	Vendors:	Comments:
E10900 - Meter Centers & Sockets	Single & Multiple, to 60kV Up to 600V AC Up to 600V AC	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #62						
E11000 - Panelboards	60 - 1200A, 10 kVAC, fuse, Ckt Brkr Up to 600V AC, 30 - 1200A Up to 1200A, 600V Max.	Yes	1 & 3	Yes	No	N/A	70	100	Yes	#73 - General Electric Co.							
E11100 - Circuit Breakers	15 - 300kA, to 600V 15 - 3000A, 600V Max. 10-4000A, 4160V Max.	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #15, 44, 143						
E11200 - Switchboards No Main Disconnect	Up to 5000A, to 600A Up to 3000A, 600V Max. 10-4000A, 600V Max.	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #3, 44, 143						
E11210 - Switchboards W/Fused switch & CT	Up to 3000A, to 600A Up to 3000A, 600V Max.	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #143						
E11220 - Switchboards W/T pressure switch+CT	Up to 3000A, to 600A Up to 3000A, 600V Max.	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #143						
E11230 - Switchboards W/Ckt Brkr & CT	Up to 3000A, to 600A 10-4000A, 600V Max.	Yes	1 & 3	Yes	No	N/A	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #62, 143						
E11300 - Ammeter AC indicating, switch	0-3000A, 0.15KV 100A - 5000A, 600V-14.4KV	Yes	1 & 3	Yes	Yes	No	100	100	Yes	#161 - Westinghouse, Inc.							
E11310 - Voltmeter AC indicating, switch	0-38KV, 5Amp & Up 0-3000A, 0.15KV 100A - 5000A, 600V-14.4KV	Yes	1 & 3	Yes	Yes	No	100	100	Yes	#143 - Square D Products							
E11320 - Wattmeter	0-899,999kVA 0-3000A, 0.15KV 100A - 3000A, 600V-14.4KV	Yes	1 & 3	Yes	Yes	No	100	100	Yes	#73 - General Electric Co.							
E11400 - Motors	115V AC-460VAC, 16-600HP 5 - 2500HP	No	No	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	No	100	100	Yes	#161 - Westinghouse, Inc.	
E11500 - Transformers Buck-Boost Type	600V, .25kVA - 5kVA .05kVA - 160kVA, .25kVA - 150kVA, 4160V Max.	No	No	No	Yes	Yes	Yes	Yes	1 & 3	No	Yes	Yes	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #5, 143
E11510 - Transformers Dry Type	600V, .9kVA - 500kVA .5kVA - 50kVA .25kVA - 1500kVA, 4160V Max.	No	No	No	Yes	Yes	Yes	Yes	1 & 3	No	Yes	Yes	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #5, 143
E11520 - Transformers Isolating	.6kVA - 300kVA .5kVA - 150kVA, 4160V Max.	No	No	No	Yes	Yes	Yes	Yes	1 & 3	No	Yes	Yes	100	100	Yes	#31 - Challenger Electrical Equipment	Additional Vendors: #5

(1) Depends on Type of Equipment

(2) Performance Derating

(3) ETI & UL listed

(4) Components Are Listed

(5) UL & AGA Listed

(6) Only Explosion-Proof

(7) ASME Section 4

(8) 60Hz Only

(9) AGA Approved

(10) Different Components Used

(11) Slower Feed Speed

(12) By Request

50Hz Vendor Selection Tables

Class:	Ratings:	100	110	120	120	127	220	240	277	# of Phases Available?	50Hz	50Hz	De-rating % USA	% USA	UL	Vendors:	Comments:
E11530 - Transformers Oil Filled	11.25 - 1000KVA To 60KV 133-1500KVA To 60KV 50VA - 1500KVA To 4160V	No	Yes	Ycs	Yes	No	No	No	No	1 & 3	Yes	Yes	No	N/A	100	Yes	#2 - A.B. Power
E11540 - Transformers Silicon Filled	11.25 - 1000KVA To 34.5KV 133-1500KVA To 60KV 50VA - 1500KVA To 4160V	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	No	N/A	100	Yes	#109 - Nissha Transformer Corp.
E11700 - Computer Power Supplies - Automatic Voltage Regulators	10A - 120A 4160V max, 10-5000kVA	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	KVA	100	Yes	#161 - Westinghouse	
E11710 - Computer Power Supplies - Computer Grade Isolation Transformers	10A - 120A 800VA - 25kVA	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	N/A	100	Yes	#2 - A.B. Power
E11720 - Computer Power Supplies - Transient Voltage Suppressors	10A - 120A 800VA - 25kVA	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	No	N/A	100	Yes	#109 - Nissha Transformer Corp.
E11730 - Computer Power Supplies - Regulator Transformers	25A - 40,000A	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	N/A	100	Yes	#161 - Westinghouse Electric Supply Co.
E11740 - Computer Power Supplies - Power Conditioners	10A - 120A 800VA - 25kVA	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	KVA	100	Yes	#39 - Computer Power Inc.	
E11800 - Power Systems - Automatic Transfer Switches	30A - 4000VA, 600V max 100A - 2600A, 600V max	Yes	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	100	Yes	#75 - General Signal Corp / Sola Division
E11810 - Power Systems - Non-automatic Transfer Switches	10-3000kVA, 600V max	Yes	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	100	Yes	#122 - Reliance Electric Co/Kato Engineering
E11820 - Power Systems - Generator Set	500W - 3000kW 1000W - 4500kW	Yes	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	100	Yes	#39 - Computer Power Inc.
E11830 - Power Systems - Line Poles, Towers, & Overhead Conductors	69-765KV 600A - 7.5KV - 200KV 1.5KV - 265KV	N/A	1 & 3	Yes	Yes	No	N/A	90	Yes	#1 - A.B. Chance Co.							
E11840 - Power Systems - Substation Equipment	1500-10000kW / 2300-13800V	N/A	1 & 3	Yes	Yes	No	N/A	100	Yes	#25 - Bridges Electric Inc.							
E11900 - Capacitors	2.4 - 34.5KV / 50-500kVAR 200V-27.5KV/2-10000kVAR	N/A	1 & 3	Yes	Yes	No	N/A	100	Yes	#94 - Lindsey Manufacturing Co.							
E12000 - Exit & Emergency Lighting - Exit Lighting Single Face Incandescent	50Hz available at 220V +/- 10% 50Hz available at 220V +/- 10% Single Face Incandescent	No	Yes	Ycs	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	100	Yes	#45 - Cooper Industries/McGraw Edison
															100	Yes	#72 - General Electric/Industry Sales & Service
															100	Yes	#161 - Westinghouse
															100	Yes	#31 - Challenger Electrical Equipment
															70	Yes	#72 - General Electric/Industry Sales & Service
															100	Yes	#32 - Chloride Systems/Lighting Alliance
															95	Yes	#48 - Converstone Direct/Ready Made Signs
															100	Yes	#59 - Dual-Lite Inc.

(1) Depends on Type of Equipment

(2) Performance De-rating

(3) ETL & UL Listed

(4) Components Are Listed

(5) UL & AGA Listed

(6) Only Explosion-Proof

(7) ASME Section 4

(8) 60Hz Only

On This Page:
Transformers, Computer Power Supplies, Power System Equipment,

Capacitors, Exit Lighting

(9) AGA Approved

(10) Different Components Used

(11) Slower Reed Speed

(12) By Request

501Hz Vendor Selection Tables

On This Page: [Exit & Emergency Lighting](#), [Light Fixtures](#), [Communication](#), [Detectors](#), [Systems](#) and [DA & Sound Systems](#)

(1) It depends on type of equipment	(10) Different Components Used
(2) Performance Derating	(11) Slower Feed Speed
(3) EFTL & UI listed	(12) By Request
(4) Gage Factor	
(5) Gage Resolution	
(6) Only Explosive Proof	
(7) ASME Section 4	
(8) 60/17 Only	

50Hz Vendor Selection Tables

Class:	Comments:											
	Ratings:	100 / 200V	110 / 220V	120 / 220V	230 / 240V	240 / 240V	277 # of Phases	50Hz Soltis	De-	% USA	UL	Vendors:
E112120 - Emergency Call Systems	10W . 50W 1/2 Watt Input	No Yes No Yes No Yes No Yes	Yes Yes Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes	No No Yes Yes Yes Yes Yes Yes	1 & 3 1 1 1	No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes Yes Yes	100 100 100 100	Yes Yes Yes Yes	#115 - Pass Sound Products Inc. #125 - Roland-Borg Corp #130 - 3M Sound Products
E112130 - Sound System Components	10W . 500W 10W . 500W 3W - 120W	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	1 & 3 1 1	No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes Yes Yes	100 100 100 100	Yes Yes Yes Yes	#115 - Pass Sound Products Inc. #125 - Roland-Borg Corp #130 - 3M Sound Products
E112740 - House Telephone System	140W - 310W / 1.5A - 3.3A 20ms - 50ms 100ms - 2A	No Yes No Yes No Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	1 1 1	No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes Yes Yes	100 100 100 100	Yes Yes Yes Yes	#117 - Comdial Corporation #49 - Conelco Inc/I.T.T. Telephone #108 - Motorola Inc.
E112900 - Fire Alarm Equipment	50Rms . 1.5A 3A 1/2A - 24A	No Yes No Yes No Yes	Yes Yes Yes Yes N/A N/A	Yes Yes Yes Yes N/A N/A	Yes Yes Yes Yes N/A N/A	Yes Yes Yes Yes N/A N/A	1 1 (*)	Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes	100 100 100	Yes Yes Yes	#54 - Detection Systems Inc. #106 - Monaco Enterprises Inc. #119 - Pitway Corp/Notifier Division
E112910 - Smoke & Heat Detectors	12 & 24VDC operation 12 & 24VDC operation	No Yes No Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	1 1	Yes Yes Yes Yes	Yes Yes Yes Yes	100 100	Yes Yes	#70, 118 #119 - Pitway Corp/Notifier Division
E113000 - Recepticles Standard	15-63A @ 125V, 10-16A @ 250V 15-60A, Type A-J 3-20A, Type A-J	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	1 & 3 1 1	No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes Yes Yes	50 0 30	Yes Yes Yes Yes	#88 - International Configuration Inc. #116 - Pass & Seymour / LeGrand #115 - Panel Components Corp
E113010 - Recepticles GFCI	15-63A @ 125V, 10-16A @ 250V 15-820A, @ 120V, 10A @ 250V 3 - 20A, Type A-J	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	Yes Yes Yes Yes Yes Yes	1 1 1	No Yes Yes Yes Yes Yes Yes Yes	No Yes Yes Yes Yes Yes Yes Yes	50 0 30	Yes Yes Yes	#88 - International Configuration Inc. #116 - Pass & Seymour / LeGrand #115 - Panel Components Corp

On This Page
Sound System
Fire Alarm Sys-

*) Uses DC voltage provided by Fire Alarm Equipment

- (1) Depends on Type of Equipment
- (2) Performance Derating
- (3) ETL & UL Listed
- (4) Components Are Listed

- (9) AGA Approved
- (10) Different Comp.
- (11) Slover Feed Sp.
- (12) By Request

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501Hz Vendor Selection Tables

On This Page:
**Swimming Pool Equipment, Water Heaters, Boilers,
Duct Heaters, & Furnaces**

) Special Transformer Use

- (1)) Depends on 1 type of Equipment
- (2) Performance Derating
- (3) FTL & UL Listed
- (4) Components Are Listed
- (5) UL & CSA Listed
- (6) Only Explosion-Proof
- (7) ASME Section 4
- (8) 60Hz Only
- (9) None Approved
- (10) Different Components Used
- (11) Slower Red Speed
- (12) By Request

501Lz Vendor Selection Tables

1

(iii) Slower Feed Speed

(12) By Request

330

5017. Vendor Selection Tables

E10

USACERL TR-98/28

Line:	Ratings:	100	110	120	127	220	240	277	# of Phases	100V / 480V	100V / 480V	100V / 480V	100V / 480V	Sold?	Dealing w/	% USA	% USA	UL	Ventilat:	Comments:		
M11330 - Computer Room Air Conditioning	3 Ton - 20 Ton	Yes	Yes	Yes	No	Yes	Yes	3	Yes	Yes	Yes	Yes	Yes	No	N/A	100	(3)	840 - Contempo Engineering	Additional Vendors: #55, 81			
	1 Ton - 100 Ton	No	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	Yes	No	N/A	100	(4)	9148 - Tel Humil Inc.				
	18 MBH - 6000 MBH	Yes	Yes	Yes	Yes	Yes	Yes	1 & 3	Yes	Yes	Yes	Yes	Yes	Yes	(1)	100	100	Yes	8149 - The Applied Companies			
M11340 - Contenders	1 Ton - 1000 Ton	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.	Additional Vendors: #14, 16, 61, 67, 82, 85,								
	1.5 Ton - 100 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	(1)	100	100	No	8151 - United Technologies / Carrier A/C									
	10 Ton - 600 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	(2)	100	100	Yes	8164 - York International	Additional Vendors: #92, 147, 149, 153								
M11350 - Air Conditioning Controls	Full Range	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.	Additional Vendors: #150							
	Full Range	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	(2)	100	100	Yes	8185 - Hydrotherm Inc.								
M11360 - Air Conditioning Cooling Towers	5 Ton To 10,000 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	CFM	80	100	(4)	8114 - Amsted Industries/Baltimore Aircell	Additional Vendors: #150							
	40 Ton - 300 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8169 - Evapco Inc.								
	10 Ton - 500 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8149 - The Applied Companies								
M11370 - Air Conditioning Dehumidifiers	1.75Ton - 70ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8160 - Damont Industries	Additional Vendors: #82, 94, 129,							
	50 CFM - 50,000 CFM	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	N/A	100	100	(4)	8198 - MRI Company		
	1.20Ton & 30.10ton	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	(4)	8148 - Tek Illumitrol Inc.		
M11380 - Air Conditioning Evaporators	12MBH - 6000MBH	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8169 - Evapco	Additional Vendors: #149, 153
	12MBH - 300MBH	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	N/A	100	100	(5)	8127 - Reed Natl/Sterling Alton Applied Air		
	12MBH - Custom MBH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8140 - Snyder General Corp								
M11390 - Air Conditioning Fan Coil Air Conditioning	200 CFM - 4000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.	Additional Vendors: #13, 18, 62, 111.							
	800 CFM - 2000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8192 - Lenox Industries								
	100 CFM - 4000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8164 - York International	Additional Vendors: #19, 38, 81, 82, 85,							
	1 Ton - 25 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8169 - Evapco								
	800 CFM - 2000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.								
	2 Ton - 20 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8164 - York International	Additional Vendors: #110, 149, 151							
M11410 - Air Conditioning Roof-Top Units	1 Ton - 110 Ton	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8192 - Lenox Industries	Additional Vendors: #38, 57, 61, 78,	
	2 Ton - 20 Ton	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8192 - Lenox Industries		
	10 Ton - 150 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8127 - Reed Natl/Sterling Alton Applied Air								
M11420 - Self-Contained Single Package Air Conditioning	1 Ton - 80 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.	Additional Vendors: #16, 18, 21, 61, 81, 82							
	2 Ton - 20 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8164 - York International								
	1 Ton - 100 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8112 - American Standard / Trane Co.	Additional Vendors: #94, 110, 149, 151							
M11430 - Air Conditioning Water Chillers	130 - 1500 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C	Additional Vendors: #40, 55, 61, 81, 120, 147, 149, 151							
	15 Ton - 5000 Ton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C								
M11440 - Air Conditioning Window Units	5600 BTU - 31,500 BTU	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C	Additional Vendors: #111 - North American Carrier Co.	
	5400 BTU - 24,000 BTU	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C		
	5000 To 30,000 BTU	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C	Additional Vendors: #111 - North American Carrier Co.							
M11450 - Air Conditioning Air Cleaners	300CFM - 1400CFM	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8151 - United Technologies / Carrier A/C	Additional Vendors: #118, 94, 105	
	20 - 10,000 SCFM	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8150 - The Applied Companies		
	450CFM To 4000CFM	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8145 - Slantair Int'l / Powermatic		
M11460 - Air Conditioning Air Handling Units	0 To 50000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8152 - Raytheon Co / Amana Refrigeration	Additional Vendors: #13, 42, 80, 105,							
	0 To 30000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	No	8151 - United Technologies / Carrier A/C								
	1000 To 70000 CFM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A	100	100	Yes	8164 - York International	Additional Vendors: #126 - Raytheon Co / Amana Refrigeration							

- (1) Depends on Type of Equipment
 (2) Performance Rating
 (3) UL & UL Listed
 (4) Components Are Listed
 (5) UL & AGA Listed
 (6) Only Explosion Proof
 (7) ASME Section 4
 (8) 60Hz Only
 (9) AGA Approved
 (10) Different Components Used
 (11) Short Read Speed
 (12) By Request

501Hz Vendor Selection Tables

On This Page:
Explosion-Proof Air Conditioning

DISTRIBUTION

U.S. Department of State 22219
ATTN: FBO/BDE/ESB (75)

Defense Technical Info. Center 22304
ATTN: DTIC-FAB (2)

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